MARCH
1959

PRICE 75 CENTS

ELECTRICAL CONSTRUCTION AND MAINTENANCE

WITH ELECTRICAL CONTRACTING

SNOW MELTING

heating cables keep Illinois super-highway toll plazas clear of snow and ice.

Highway Lighting

Features of new Baltimore city by-pass highway lighting and power systems.

EXPANDED FACILITIES

for tomorrow's electrical maintenance needs, the Maintenance Co.'s new headquarters.

A McGRAW-HILL PUBLICATION | 58TH YEAR

NEW
GUTH KOLORKODED* industrial fixtures with built-in

TRAFFIC LIGHTS

Designed to direct traffic, protect your workers, identify various plant or storage areas . . . and create new standards of seeing-efficiency for greater productivity.

They "wash away" ceiling shadows, yet assure high footcandles with comfortable shielding for the working level: 10% uplight with 13° cut-off or 25% uplight with 27° cut-off . . . for 430, 800 or 1500 M. A. operation. Easy installation and maintenance. Three reflector finishes—Permalux White, Porcelain or Alzak Aluminum.

WRITE FOR FREE KOLORKODED BULLETIN

*Copyright &U.S. & Can. Pats. applied for.

RLM

Standard Porcelain reflector units (without Kolorkode) for general work areas are RLM listed.

at exits, fire protection systems, keep-out areas, etc.

at stairs, curbs, dead ends and other hazard areas.

in aisles, safe storage, first-aid, etc.

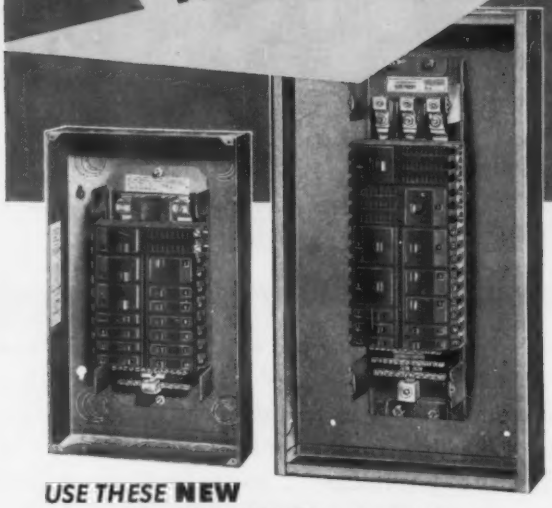
Guth LIGHTING

THE EDWIN F. GUTH CO.
2615 Washington Blvd., St. Louis 3, Mo.
TRUSTED NAME IN LIGHTING SINCE 1902

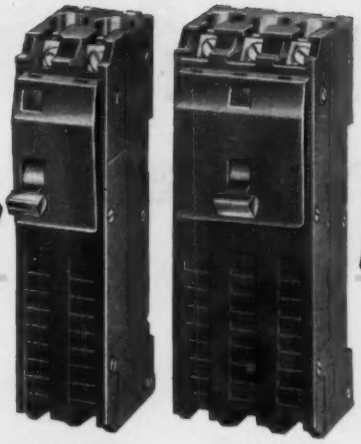
QO
FINEST BREAKER EVER BUILT!

NOW— 15 thru 100 amps

USE THEM in BOTH LOADCENTERS AND PANELBOARDS!



NEW!



NEW!

2-POLE 70-100 Amp

3-POLE 70-100 Amp

DESIGN LEADERSHIP FEATURES OF THE **NEW 100 AMP Q1 BREAKERS**

- Fit all existing QO loadcenters and NQO panelboards
- Plug-in units let you assemble loadcenters and panelboards to meet any requirement
- Lugs are approved for aluminum or copper #1/0 wire
- *Quick-make, quick-break. Prevents "teasing"*
- *Trip indication. Tells instantly whether circuit has been turned off intentionally or "tripped"*
- Temperature compensated—prevents nuisance tripping
- Common trip prevents single phasing or personal injury
- Single handles for modern, streamlined appearance
- Plated jaws and connectors assure positive connections
- *Heavy-duty industrial quality for long life and trouble-free operation*

USE THESE **NEW 100 AMP UNITS** LIKE THIS...

As MAIN BREAKERS in any loadcenter or panelboard... just plug them in! Or as 100 ampere maximum, 2 or 3 pole BRANCH BREAKERS for motor loads, electric heating loads, and sub-feeds to other panelboards.

Write for Bulletin SD-100. Address Square D Company, 6060 Rivard Street, Detroit 11, Michigan

THE "QO" FAMILY

QO 1-POLE 15-50 Amp | QO 2-POLE 15-70 Amp | QO 3-POLE 15-50 Amp | Q1 2-POLE 70-100 Amp | Q1 3-POLE 70-100 Amp

EC&M HEAVY INDUSTRY ELECTRICAL EQUIPMENT...NOW A PART OF THE SQUARE D LINE

SQUARE D COMPANY

A "Package" from APPLETON®

JIC-100 Emergency Kit

EMERGENCY KIT CONTENTS:

5—JIC-B boxes worth $1.80 each, or a total of	$9.00
5—JIC-C blank covers worth .40 each, or a total of	2.00
10—HUB-50 HUBS worth .65 each, or a total of	6.50
10—HUB-75 HUBS worth .74 each, or a total of	7.40
Total Value	$24.90
You Pay Only	18.90
YOU SAVE	**$6.00**

(on material cost alone)

Equip Each of Your Crews with a JIC-100 and Prove You Save Its Cost In Just a Few Weeks!

JIC Just In Case

It's another APPLETON first...and a bargain!

How often has one of *your* men had to leave a job to rush to an electrical wholesaler to pick up a ½" or ¾" junction switch or receptacle Unilet? Now, he can make up his own Unilet right on the job with a No. JIC-100 Emergency Kit. Remember, JIC . . . Just In Case . . . and you will sing its praises too, like so many of our other contractor friends who have written in to thank us for the inconvenience and trouble the JIC-100 Emergency Kit saved them. For complete details of various uses see Schedule ST. Next time you order, ask about the JIC-100!

Sold Through Franchised Distributors Only

APPLETON ELECTRIC PRODUCTS®

APPLETON ELECTRIC COMPANY
1701 Wellington Avenue • Chicago 13, Illinois

Also Manufacturers of:


"ST" Series Connectors


Malleable Iron Unilets


Industrial Lighting Equipment


Automatic Reelites

ELECTRICAL CONSTRUCTION AND MAINTENANCE

with which is consolidated Electrical Contracting. The Electrogist and Electrical Record . . . Established 1901

Published for electrical contractors, electrical departments in industry, engineers, consultants, inspectors and motor shops. Covering engineering, installation, repair, maintenance and management in the field of electrical construction and maintenance.

58TH YEAR • MARCH 1959

Washington Report 7

Sidelights 8

Electric Heating for Schools, *An Editorial* 83

Heating Cables 85
Snow and ice removed by heating cables installed at toll collection plazas on three Illinois superhighways.

Urban By-Pass Highway Lighting 88
By E. F. SIEGEL—lighting of roadway, approaches and interchanges of new Baltimore City by-pass represents an important design factor of the $130 million controlled-access Baltimore Harbor Tunnel project.

A New Era of Electrical Service 92
One of New York's first service organizations has begun its 62nd year of electrical operations in a new plant with vastly improved repair and maintenance facilities.

Tennis Court Floodlight 95
Fluorescent lamps provide tennis court floodlighting at Tucson Racquet Club.

Safe Transporting of Heavy Equipment 96
By R. M. WOOD—Detailed planning and careful handling procedures backed successful transportation of a 200-ton generator stator to a power plant in Somerset, Mass.

Display Flexibility with Plug-in Ceiling Channels 100
Design by G & M Electric combines multi-outlet raceways in flush continuous channels; adds plug-in convenience to rigid supporting medium.

Select the Right Generator 103
By C. C. LIBBY—Here's how to select the minimum generator rating required for industrial plant supply.

Load Centers for Modern Apartments 108
By J. F. McPARTLAND—New York City utility suggests standards for load centers for modern apartments.

Fire Locator System 110
Large western department store protects life and property with low-voltage fire locator system consisting of 36 zones.

Metallizing Rotor Shafts 112
A process whereby the repairing of worn and damaged rotor shafts to fit standard bearings is accomplished efficiently and economically.

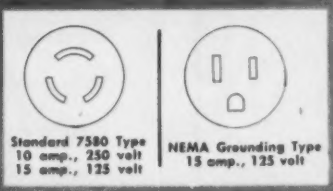
MORE

engineering news

HARVEY HUBBELL, INCORPORATED
Engineering Department

WHY A 4700 LINE?

Ever since the advent of National Electrical Code requirements for the grounding of portable equipment at the



Standard 7580 Type
10 amp., 250 volt
15 amp., 125 volt

NEMA Grounding Type
15 amp., 125 volt

125 volt level, a definite need has existed for a locking receptacle meeting these requirements.

To answer that need Harvey Hubbell, Inc. has developed a new "Twist-Lock" receptacle that meets all of the code requirements and those of Underwriters' Laboratories, Inc. for 125 volt grounding as well as provide a vibration-proof locking connection.

The 4700 line, as is the well known N.E.M.A. standard grounding receptacle, is equipped with a ground connection terminal, hexagonal in shape,

New 4700 Type
15 amp., 125 volt

Elbow-shaped Grounding Slot

green in color and electrically connected to the mounting strap or yoke. It provides, too, split circuit convenience, removable washer type plaster ears, pressure plate back wiring, all completely enclosed in a husky molded phenolic casing.

The Hubbell 4700 receptacles, caps and connectors are non-interchangeable with any "Twist-Lock" presently in use. There can be no conflict of ratings or electrical service. The 4700 has only one rating: 15 amp., 125 volt A.C. It cannot be mis-applied electrically, as its sole function is to provide for equipment ground connections on single phase, 125 volt circuits—exactly the same job as the N.E.M.A. grounding receptacle performs with the additional all-important feature of providing a LOCKING connection that cannot accidentally disconnect and interrupt power service.

Continued on page 19

ELECTRICAL CONSTRUCTION AND MAINTENANCE

MARCH • 1959 *continued*

Maintenance Problem Solved by Electric Spiders.... 114
Washing outside glass surface in sky-scraper 650-window completely sealed structure is facilitated through use of vertical- and horizontal-traveling stage powered and controlled directly from a mobile platform.

Remote Switching for Small Plant..... 117
Apex Signal Services use low-voltage relay switching for control of all lighting circuits.

Suspension Techniques 120
Use of channels, jacks and hoists facilitate mounting of bus ducts, conduit banks and lighting fixtures in California industrial plant.

Practical Methods 123
Adjustable floor hides cables; electric units heat AMA Academy; plastic conduit for underground circuits.

Reader Service 139
Product news announcements; catalogs and bulletins.

Reader's Quiz 173
Questions and answers on corrosion; aluminum conductors, electric heater.

Questions on the Code 183
Answers to code questions on grounding and bonding at services; outdoor fixture installations; termination of uninsulated conductor.

Data Sheet 201
Electrical Rehabilitation for Flooded Areas.

Motor Shops 205
Pedestal clamp holds large coils; tank loading easy with floor degreaser; reel storage tree spots wire for payout.

In the News 210

Dates Ahead 228

Vol. 58, No. 3 ELECTRICAL CONSTRUCTION and MAINTENANCE March 1959

Published monthly with an additional issue in September by McGraw-Hill Publishing Company, Inc. James H. McGraw (1860-1948), Founder. Executive, Editorial, Circulation and Advertising Offices: McGraw-Hill Building, 330 W. 42nd St., New York 36, N. Y. See panel below for directions regarding subscriptions or change of address. Publication Office, 99-129 North Broadway, Albany 1, N. Y. Officers of the McGraw-Hill Publishing Co., Inc.: Donald C. McGraw, President; Joseph A. Gerardi, Executive Vice-President; L. Keith Goodrich, Vice-President and Treasurer; John J. Cooke, Secretary; Officers of the Publications Division: Nelson L. Bond, President; Shelton Fisher, Senior Vice-President; Ralph B. Smith, Vice-President and Editorial Director; Joseph H. Allen, Vice-President and Director of Advertising Sales; A. R. Venezian, Vice-President and Circulation Coordinator.

Subscriptions are solicited only from persons engaged in electrical construction, maintenance or consulting services. **Position and company connection must be indicated on subscription orders.**

United States subscription rate for individuals in the field of the publication $3.00 per year. This issue 75 cents. Electrical Products Guide $2.50. Canada, $5.00 a year. All other countries, $15.00 a year, payable in advance. Second class postage paid at Albany, N.Y. Printed in U. S. A. Title registered in U.S. Patent Office.

SUBSCRIPTIONS: Send subscription correspondence and change of address to Subscription Manager, Electrical Construction and Maintenance, 330 West 42nd Street, New York 36, N. Y. Subscribers should notify Subscription Manager promptly of any change of address, giving old as well as new address, and including postal zone number, if any. If possible, enclose an address label from a recent issue of the magazine. Please allow one month for change to become effective.

Postmaster . . . Please send form 3579 to Electrical Construction and Maintenance, 330 West 42nd St., New York 36, N. Y.

They both know the best buy in tape...

ACCURATE TAPES

FRICTION .... RUBBER .... PLASTIC

- non-raveling
- straight tearing
- high tensile strength
- strong adhesion
- highly insulating

Send for our latest catalog describing details

ACCURATE MANUFACTURING COMPANY
Garfield, New Jersey

Washington Report

MARCH • 1959

The optimistic forecasts of two months ago for the U. S. economy during 1959 are being tempered somewhat by some Government economists. These spokesmen indicate that business activity may level off during the last half of the year instead of continuing upward at recent rates. This viewpoint was undoubtedly influenced by testimony presented to the Congressional Joint Economic Committee recently by President Eisenhower's top economic advisers, and a parade of leading economists from business, labor, and the academic world.

Administration economists earlier predicted a gross national product annual rate of $480 billion by the fourth quarter, up some $27 billion from the fourth quarter of 1958. Some admit this may be $5 to $10 billion too high, depending to considerable extent on total sales of autos, and on capital spending.

National economy statistics reflect continuing moderate growth, including some weaknesses.

- **Gross national product** (GNP) is running at an estimated $463 billion annual rate—up $37 billion from the recession low, and up $10 billion from fourth-quarter 1958 annual rate.
- **Industrial production** increased in January for the ninth straight month to 143% of the 1947-49 average (FRB Index), but still lags the pre-recession high of 145% in August 1957 by two points.
- **Personal income** rose in January to a record $362.3 billion adjusted annual rate, up $13.5 billion from January 1958.
- **Cost-of-Living** dropped 0.2% in December to 123.7% of 1947-49 average (BLS Consumer Price Index) from November record high, but was still 1.7% above the December 1957 figure.
- **Employment** in January was 62.7 million, and in 1958 averaged 64 million. This was down from the 65 million average for both 1957 and 1956.
- **Unemployment** in January was 4.7 million, and February's jobless is estimated at about 5.2 million. Unemployment averaged 4.7 million last year, with a recession monthly high of 5.4 million, compared with 2.9 million for 1957.

Donald Fitzpatrick has been named Adviser to the Director, Electrical Equipment Division, BDSA, U. S. Dept. of Commerce, on loan to Government from Allen-Bradley Co., Milwaukee, Wisc. on temporary assignment—usually a six month's period.

New construction activity during January set a new high for the month of $3.7 billion, compared with $3.3 billion a year earlier. This was a drop of $0.3 billion from December, considered normal. Private spending in January was $2.6 billion, while public construction outlays totaled $1.1 billion.

Home building starts for 1958 were finally toted up at 1,197,700, compared with 1,041,900 in 1957, and a record 1,328,000 starts in 1955. Housing starts for January this year dropped to 83,300, first decline in ten months, for a seasonally-adjusted annual rate of 1,350,000 starts. This, however, was 20,400 more units than were started in January 1958.

REA Co-ops unanimously opposed increase of their existing 2% interest rate on Federal loans early in February, when 7,000 members of National Rural Electrical Cooperatives Association met in Washington. Democratic Congressional leaders further promised to fight the interest rate boost. President Eisenhower has asked that the rate be raised to cover the treasury's cost of borrowing the money, as part of his program to balance the budget.

Sidelights

FLOOD REPAIRS

In many parts of the United States there have been heavy snow storms and extremely cold weather this winter and when the Spring thaws come, some areas may be faced with floods. And when this happens, floods leave behind a clean-up job of hugh proportions for electrical motor repair shops and electrical contractors. In a data sheet entitled "Electrical Rehabilitation for Flooded Areas", page 201, we have listed some experience tested methods to use when faced with this problem.

ALUMINUM CONDUIT

Since our December 1958 editorial discussed the new competitive position of rigid aluminum conduit at a 20% premium, a new price schedule announced by one supplier last month drops the price still further to within 2 or 3% of the price of rigid galvanized steel conduit. The new price move leaves no doubt that aluminum conduit, heretofore marketed as a premium priced specialty, is moving into a strongly competitive position for general use. Considering the labor saving potential of the light metal, the small remaining premium is not expected to be a critical factor in competitive sales.

HIGHWAY LIGHTING

The Baltimore by-pass, which permits through traffic to avoid the congested downtown area consists of a 6300-ft terminal, 17 miles of roadway, 12 interchange and 53 bridges. The roadway lighting of this heavily travelled route was carefully planned to contribute effectively to night driving safety and is considered by illumination engineers to be a model of highway lighting application. The project is described by Ernest F. Siegel, Chief Mechanical-Electrical Engineer of Green Associates, Inc., in the article "Urban By-Pass Highway Lighting" beginning on page 88.

SNOW REMOVAL

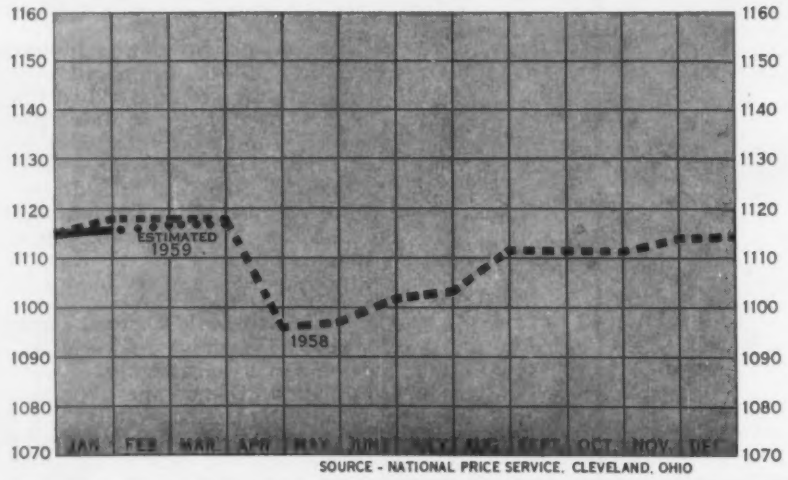
Keeping the toll plazas of Illinois super-highways clear of snow and ice is now accomplished by electrically heated snow melting installations. Heating cables bound to wire mesh mats are installed on the reinforcing iron of the concrete plaza paving. Power is applied at 20 watts per square foot. The installations are described in "Heating Cables" beginning on page 85.

FIRE LOCATOR

A complete fire alarm system installed in a large Spokane department store combines manual stations with automatic fire detectors and displays the location of the fire signal on a 36-lamp annunciator. The installation by Power City Electric, Inc. is described in "Fire Locator System" beginning on page 110.

ELECTRICAL MATERIALS COST INDEX

BASE LINE (1000) REPRESENTS COSTS OF TYPICAL ASSORTMENT OF MATERIALS FOR A SELECTED JOB AS OF NOVEMBER 1, 1951. INDEX POINTS REPRESENT THE VARIATION OF THESE SAME MATERIAL COSTS AS OF THE FIRST OF EACH MONTH.



SOURCE - NATIONAL PRICE SERVICE, CLEVELAND, OHIO

Featured in Homes of all Leading Builders

NuTone
INTERCOM-RADIO

Speak to strangers without opening door

Keeps an ear on child in nursery or playroom

Each room can originate calls to any other

A Step Saver for Busy Homemakers..

See Next Page

Talk to any room without wasting time

A bedside companion for sick-room

Talk to your family inside or outside

A "Sound" Investment that pays dividends in Faster Home Sales!

NuTone

INTERCOM & RADIO SYSTEMS

EASIEST TO INSTALL

U. S. and Foreign Patents Pending

MODEL 2016

AM and FM DeLuxe

Beautiful Copper Anodized or Stainless Brushed Chrome master control panel — seven tubes plus Silicon Rectifier. The only AM-FM home radio shielded to meet FCC specifications. For AM and FM broadcasts, 8 station selector switches. Set includes Master Control, 3 inside remotes, 1 outside remote, plus all wire and antenna. Complete — only $179.50 list.

SEND FOR FREE DELUXE CATALOGS IN BINDER

EASIEST TO OPERATE

MODEL 2012

Standard AM

Never before a luxurious intercom-radio like this at such low cost. Copper Enamel or Aluminum Enamel master control. Six tubes, 8 station selector switches — also phono-jack connection. AM Broadcast range 540 to 1650 KC. Set includes Master control, 3 inside remotes, 1 outside remote, plus all wire and antenna. Complete — only $129.50 list.

Write NuTone, Inc., Dept. EC 3, Cincinnati 27, Ohio

8 Reasons Why NuTone Intercom & Radio is Your Best Buy..

1

FULL TIME INTERCOM
Radio or Recorded Music never kills Intercom reception.

2

CHOICE OF AM and FM
For static-free reception Deluxe Systems have FM and AM Radio

3

VARIABLE ROTARY CONTROLS
Gives infinite volume settings instead of only 2 or 3 levels.

4

$500,000.00 GUARANTEE BOND . .
NuTone backs its Intercom-Radio with this unusual factory policy.

5

SIMPLE SETTING AT MASTER
No back and forth walking to distant rooms to adjust speakers.

6

AUTOMATIC ACOUSTIC LEVEL
Intercom always heard above Radio or Recorded Music.

7

NINE PRIMARY STATIONS
If more stations are desired speaker circuits can be doubled.

8

FINEST INTERCOM FIDELITY
Voices easy to recognize without distortion. No annoying hum.

Smithcraft large element lighting

The easiest "big fixture" to install ever designed! Large Elements are pre-assembled and wired; they are simply removed from the carton and mounted like any other fixture. To form large "floating areas", elements are bolted together in both directions, providing all the effect and utility of overall ceiling lighting. And there are no costly wall attachments! Excellent for high level illumination with maximum comfort, uniform low brightness and a modern architectural appearance.

ANOTHER SMITHCRAFT FIRST! Smithcraft Large Element Lighting . . . the large area luminaire with POWER-GROOVE Lamps! For very high level illumination in department stores, offices, laboratories, etc.

A "FLOATING" CEILING. With five different sizes of units from 4'x4' to 8'x6', a wide variety of areas and patterns are possible. Modules have exact dimensions in both directions.

FREE! The Smithcraft LIGHTESTER . . . enables your customers and prospects to "grade" their own lighting! A creative selling aid for you! For your sample LIGHTESTER, fill out and mail the coupon.

Smithcraft Lighting Chelsea 50, Mass.

☐ Please send me a FREE sample of LIGHTESTER and complete information on how I can use the "LIGHTESTER" to increase my sales.

NAME_____

COMPANY_____

ADDRESS_____

CITY_____ STATE_____

America's finest fluorescent lighting

Smithcraft
LIGHTING
CHELSEA 50, MASSACHUSETTS

"Telephone planning is a 'must' in every home we build"

—SAYS HOWARD B. QUINN, QUINN HOME BUILDERS, INC., CHICAGO, ILLINOIS

Thirty minutes to the southwest of the center of Chicago lies Beverly Terrace, a gracious community of 200 homes in which "extra" conveniences are the rule, not the exception.

A striking example: each home contains no less than 10 telephone outlets.

"We've earned a reputation for quality construction, de luxe equipment and built-in features," says builder Howard Quinn. "And an abundance of telephone outlets, with wiring neatly concealed in the walls, is just the kind of feature that helps set our homes apart.

"People are delighted when we point out how flexible their telephone service can be—with extensions indoors and out. The wiring's all there whenever they want to use it.

"We're in business to sell homes—and telephone planning helps us do it. It's as simple as that. So it's a 'must' in every home we build."

* * *

Your local Telephone Business Office will gladly help you with telephone planning for your homes. For details on home telephone installations, see Sweet's Light Construction File, 8i/Be. For commercial installations, Sweet's Architectural File, 32a/Be.

BELL TELEPHONE SYSTEM

Beverly Terrace homes like the one below even include outdoor telephone facilities. At lower right, Howard Quinn and Illinois Bell Telephone Company's Bill Dutcher inspect a jack-type outlet on the patio.

B-M THE ORIGINAL INDENTER FITTINGS

Over 25 Years of Proven Performance

Permanent locked-in bushing insures smooth burr-free raceway for easy fishing. No extra work.

BRIEGEL RED THROAT

1. Protruding rounded red plastic lip of bushing prevents cutting of insulation—eliminates shorts.
2. Full thread screws into all conduit fittings. Lip of RED THROAT bushing protects thread from damage.
3. Deep dished eight pronged lock nut is easier to drive on—screws flush to shoulder and digs into metal of box for vibration proof positive ground.
4. Two quick squeezes with The Briegel Indenter and BM All Steel Indenter Fittings are set forever. Metal is pressed into metal for permanent installation and positive ground.

NEW POCKET SIZE INDENTERS

Just 10" long, these new patented compound leverage indenters are only plier size. Lighter to carry and easier to use—the leverage does the work. No. 607 for ½" and No. 608 for ¾" fittings.

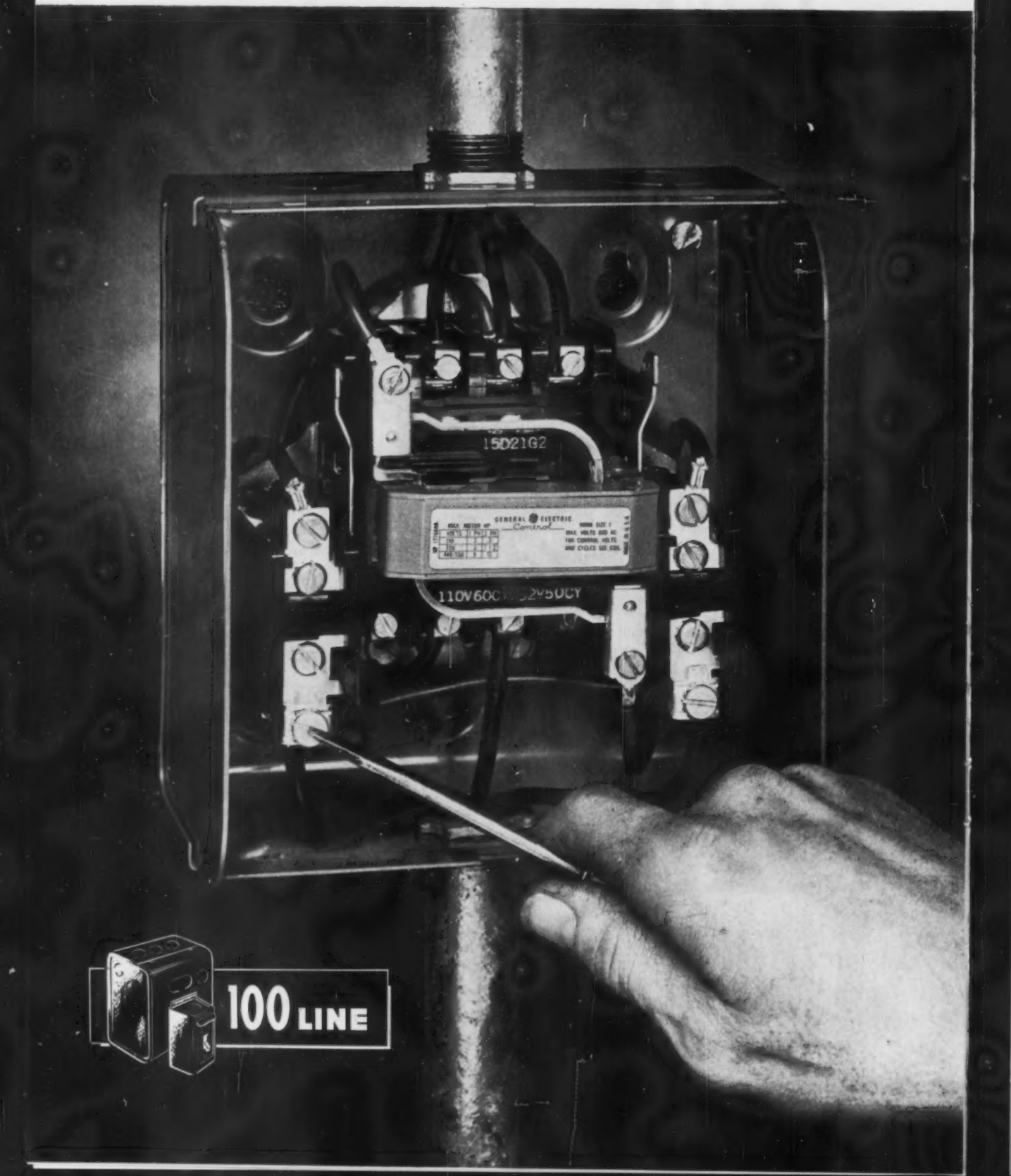
BRIEGEL METHOD TOOL COMPANY

GALVA, ILLINOIS

All B-M Indenter Fittings are U.L. Approved as concrete-tight and for general use (File Card E10863). Also comply With Federal Specifications W-F-406.

ALL BRIEGEL FITTINGS ARE U. L. APPROVED AS CONCRETE-TIGHT

"STRAIGHT-THROUGH" WIRING, 32% MORE



WIRING ROOM MAKE NEW GENERAL ELECTRIC SIZE 0 AND 1 MAGNETIC STARTERS

EASY TO INSTALL

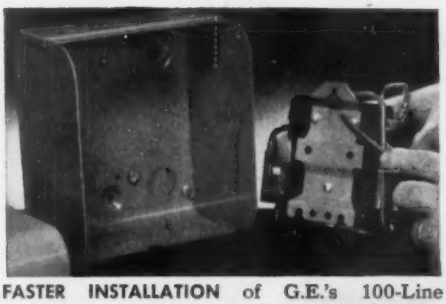
These radically different General Electric magnetic starters can practically pay for themselves by saving you installation time and money. You save because of . . .

STRAIGHT-THROUGH WIRING—All line terminals are at the top and all load terminals are at the bottom of the G-E 100-Line magnetic starter. Straight-through wiring and new pressure-type terminals save you time because no wires need be bent or looped. All wiring can be done from the front—where it's easy to see and easy to reach.

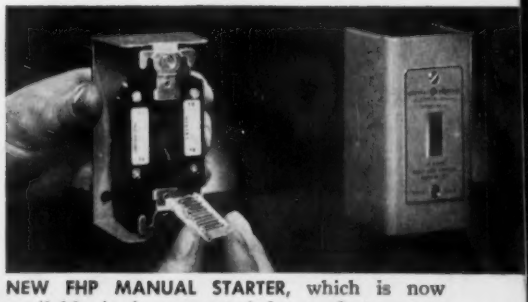
32% MORE WIRING ROOM—The Size 0 and 1 magnetic starters are smaller than previous forms, yet still leave you more room for wiring. And the wrap-around cover gives extra accessibility to the starter and terminals. To remove the enclosure cover, just press the spring-clip latch.

YOU CAN GET FREE information on these starters by contacting your nearby G-E Apparatus Distributor, or—if you prefer—you can write to Section 733-48, General Electric Company, Schenectady, N. Y. Ask for Bulletin GED-3724.

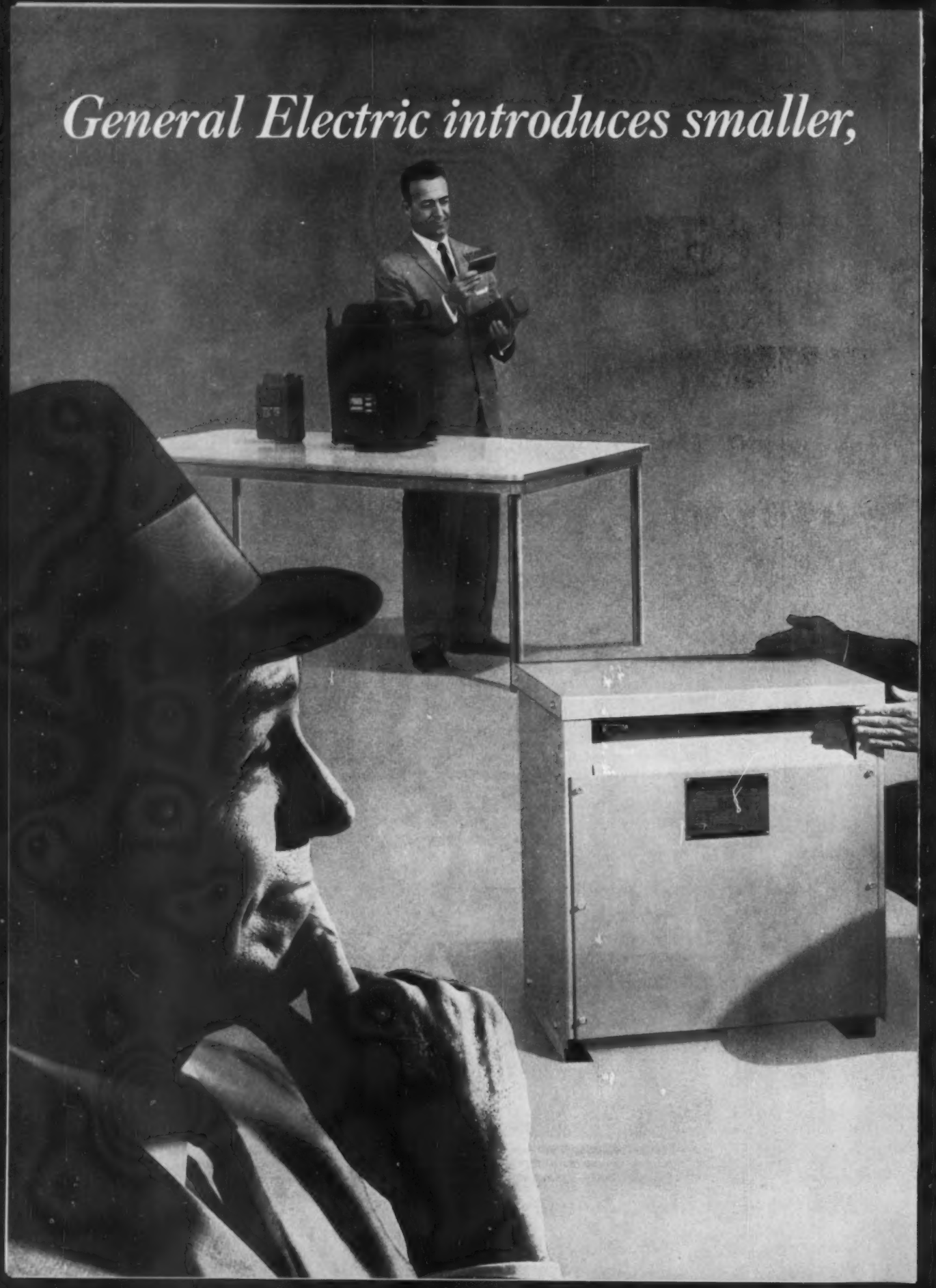
GENERAL ELECTRIC



FASTER INSTALLATION of G.E.'s 100-Line starters is possible with three-point keyhole mounting, new wrap-around enclosure cover.



NEW FHP MANUAL STARTER, which is now available in key-operated forms, features an exclusive plug-in heater. (Ask for GEA-6358.)


General Electric introduces smaller,

lighter . . .

QHT* dry-type transformers

New line cuts size up to 50 per cent, weight up to 35 per cent and is up to 15 decibels quieter than previous models.

QHT dry-type transformers give you, in every rating, in every application, a balanced combination of small size, lightweight, superior installation features, high-temperature insulation and quiet operation. This combination means easier installation and practically eliminates the major sources of dry-type transformer complaints, noise and insulation failure.

Installation is easy with the new dry-types because the units are built with convenient knock-outs, large terminal compartments and wiring spaces which are easily accessible from the front. Lifting provisions are made for units weighing more than 65 pounds. These new transformers can be located at the load which eliminates the need for long costly low-voltage feeders. No vaults, barriers, or ventilating fans are required.

A new insulation system—QHT dry-types have silicone impregnated insulation, highly moisture resistant, with an inherent ability to withstand high operating temperatures. Combined with materials such as aluminum conductors and cold-rolled grain-oriented silicon steel, you get a smaller, lighter, quiet dry-type transformer designed for years of service.

The new transformers are quiet—all have sound levels equal to or less than NEMA Standards. The rigid welded design of the units helps eliminate lamination vibrations, and on the larger units, built-in rubber mountings reduce noise transfer through conduits and mounting brackets.

Complete stocks of the new transformers are available at local electrical distributors. Single-phase units are built for applications through 167 KVA and three-phase ratings are available up to and including 500 KVA.

It will pay you to investigate how you can save on installation costs, get customer satisfaction, and be competitive, with General Electric's complete new line of quiet QHT dry-type transformers. Section 411-7, General Electric Company, Schenectady 5, New York.

*Quiet, High Temperature dry-type transformers.

GENERAL ELECTRIC

SECTION A411-7,
GENERAL ELECTRIC COMPANY
SCHENECTADY 5, NEW YORK

Please send me the new Buyers Guide, GEC-1047.

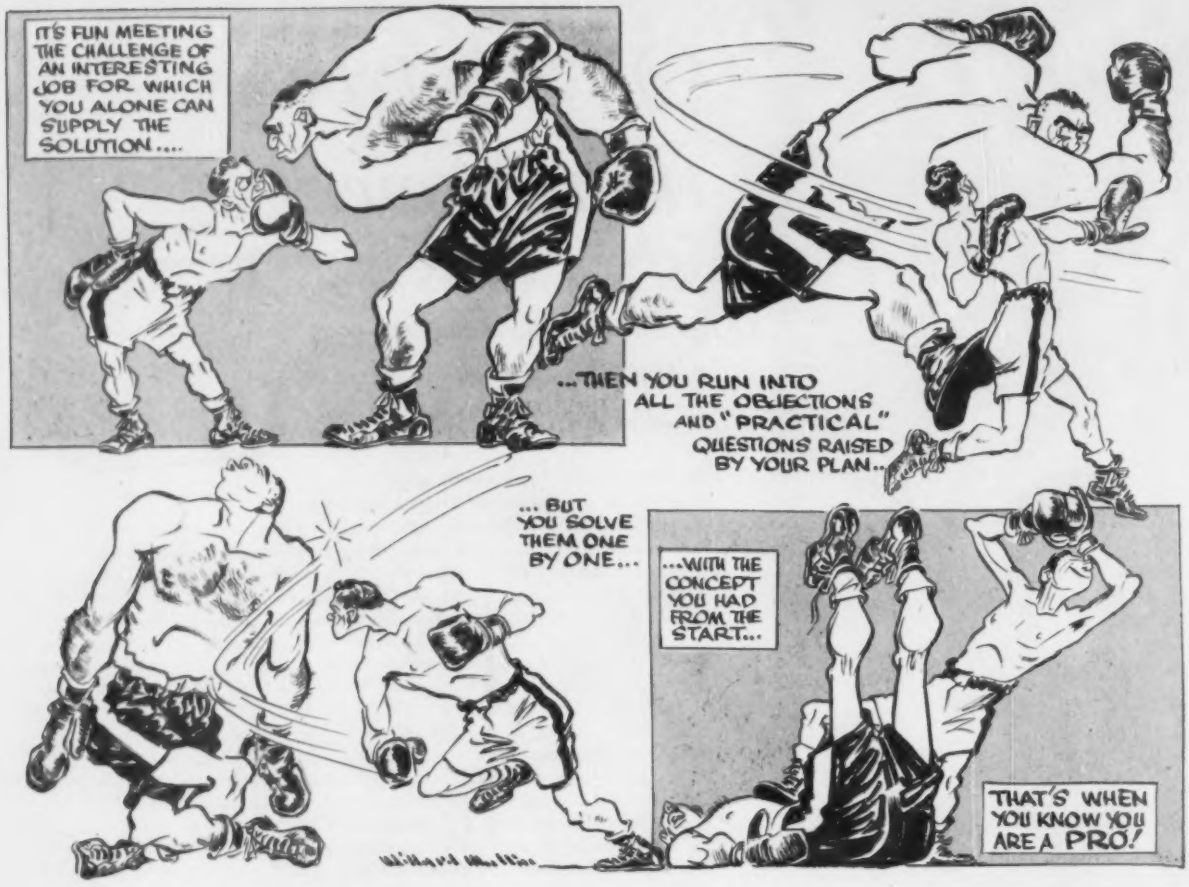
NAME .....

TITLE .....

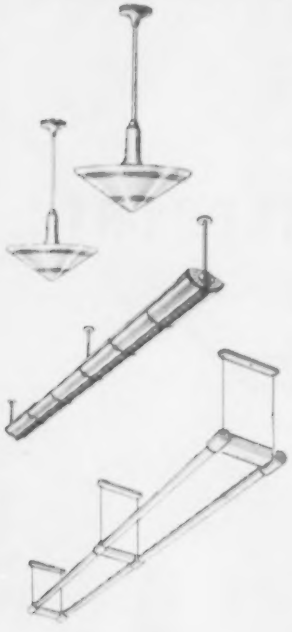
COMPANY .....

ADDRESS .....

CITY ..... **ZONE** ..... **STATE** .....



THE LIGHTING MAN'S PRIVATE FIGHT....



WILLARD MULLEN, noted sports cartoonist, points out, it's sometimes a rough road between the first idea and the soundly completed job. TO MAKE CERTAIN that their installations are basically reliable, all lighting designers insist on dependable fixtures.

BUT THE MOST CREATIVE MEN also want their fixtures to do two things more. They expect them to *light their rooms graciously* and *add a handsome note to today's streamlined interiors.* That's why the "real pro's" specify Ainsworth for their most challenging jobs.

AINSWORTH LIGHTING, INC.

38-10 29TH STREET, LONG ISLAND CITY 1, N. Y.

High Quality Lighting Since 1920

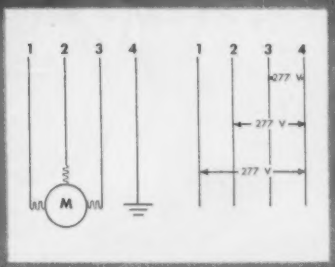
Continued from page 4

engineering news

HARVEY HUBBELL, INCORPORATED
Engineering Department

WHY A 4750 LINE FOR 277 VOLT APPLICATIONS?

480 volt, 3-phase, 4-wire circuits, commonly used by industry for heavy electrical equipment, are impractical for lighting and other applications requiring lower voltages. To overcome this drawback many firms divided their 480 volt service into three light-



ing circuits of 277 volts each (see diagram). Unfortunately, no wiring device rated at 277 volts existed, and 20 amp., 600 volt receptacles, caps and connectors had to be used for fluorescent lighting. The 20 amp. units, available in single receptacles only, were bulky and expensive, requiring twice the space and twice the effort to install.

In answer to this problem, made more urgent by the increasing use of 277 volt circuits for fluorescent lighting, and equipment designed for 277 volt circuits, Hubbell developed a complete line of locking grounding devices to meet code requirements for 277 volt fluorescent and other equipment designed for 277 volt service. This line of devices, designated as the 4750 line, provides safe and positive grounding plus locking convenience and protection. It features the first and only 277 volt duplex locking and grounding receptacle on the market. This unit, cat. no. 4750, feeds two fixtures from one single gang box, cuts the number of devices needed in half . . . cuts cost of boxes in half and saves hours of time on both fixture installation and maintenance.

DODGE REPORTS give you a head start

If you are going to get business in the new construction market, you have to know what jobs are coming up, when bids (and sometimes re-bids) are due, and if possible with whom you're competing.

When you use Dodge Reports to keep informed, you can plan your whole operation better. You have more opportunity to select the kind of jobs you want to go after. You can keep abreast of competition . . . know more about what's going on every day.

Dodge Reports, mailed to you daily, tell you in advance who's going to build what and where. *You* specify the areas (anywhere within the 37 eastern states) and types of construction you want to cover. For each project, Dodge tells you whom to see, when bids are wanted – even who else is bidding.

Get the full story on *Dodge Reports*.

WRITE FOR FREE BOOK

F. W. Dodge Corporation, Construction News Division,
119 West 40th Street, New York 18, N. Y., Dept. EC&M39

Send me the book "Dodge Reports—How To Use Them Effectively" and let me see some typical Dodge Reports for my area. I am interested in the markets checked below.

☐ House Construction ☐ General Building
☐ Engineering Projects (Heavy Construction)

Area _____

Name _____

Company _____

Address _____

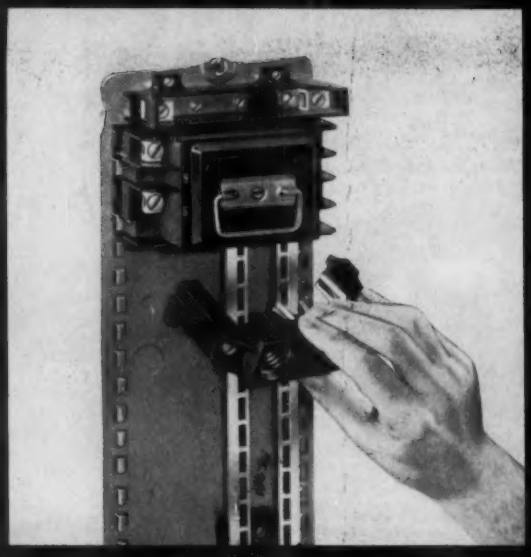
City _____ Zone _____ State _____

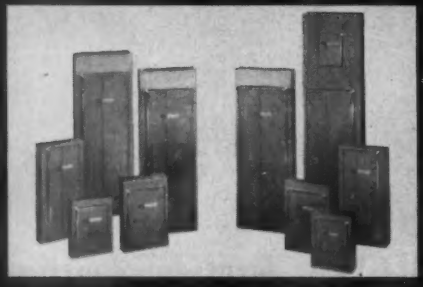
Dodge Reports
For Timed Selling
to the Construction Industry

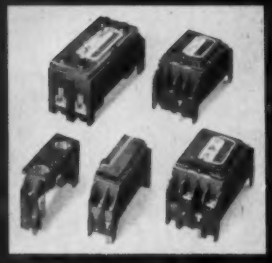
BIG NEWS!

ALL-NEW STAB-IN

fusible service equipment







10 enclosures... 5 stab-in units replace 208 devices... meet all requirements through 200 amps!

For the first time! Uncompromised flexibility—because there are no fixed circuits. Now you can tailor every installation to your exact requirements. Just stab-in circuits where you want them—when you want them! CHECK THESE FEATURES...

ENCLOSURES

- ✔ Only 10 enclosures: 5 split bus, 5 parallel.
- ✔ Dual rated for service entrance and load center applications.
- ✔ Exclusive "picture frame" combination flush/surface feature.
- ✔ Exclusive sequence bussing.
- ✔ Step-type insulated neutrals.
- ✔ Narrow width—shallow depth.
- ✔ UL approved for both copper and aluminum cable.

STAB-IN UNITS

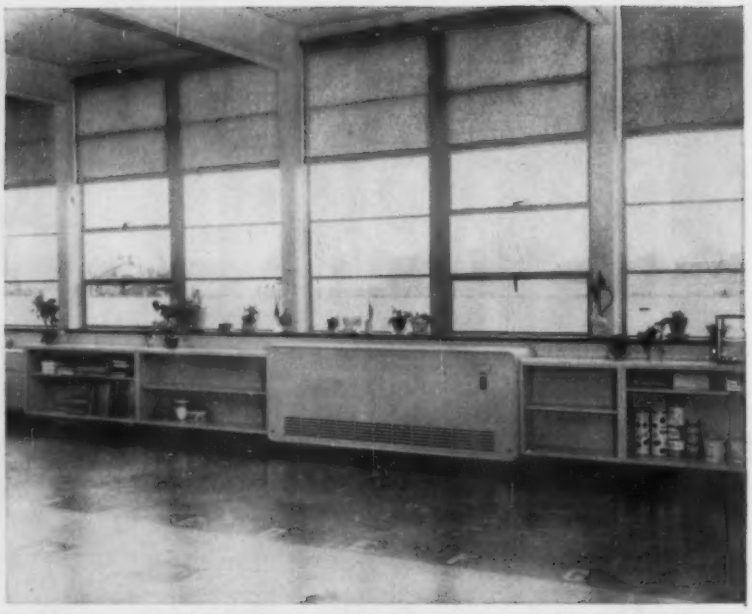
- ✔ Only 5 stab-in units: 30 amp Twin Plug-Fuse Unit, 30 amp Cartridge-fuse Pullout, 60 amp Main Cartridge-fuse Pullout, 60 amp Branch Cartridge-fuse Pullout, 100 amp Cartridge-fuse Pullout.
- ✔ Exclusive "millions-tested" four-way stabs.
- ✔ Unique locking clip insures non-interchangeability. Defeatable by qualified contractor.
- ✔ Compact new space-saving 30 and 100 amp pullout units.

Now you can afford to carry your own stock and meet all your fusible requirements through 200 amps. Get the proof! Write for Bulletin 1-215, Federal Pacific Electric Company, General Offices: Dept. 322, Newark 1, New Jersey.

FPE **FEDERAL PACIFIC ELECTRIC COMPANY**

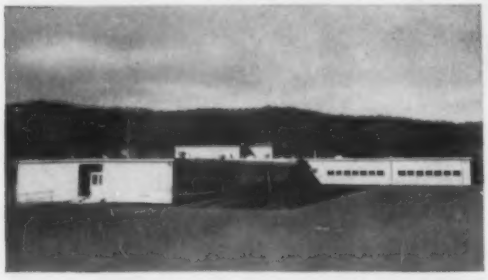
The Best in Electrical Distribution and Control Equipment

Northern Pike Elementary School
Monroeville, Pennsylvania



Woodbine Elementary School
Cicero, Illinois

Angola Elementary School—Lake Shore, New York



Jenkins Elementary School
West Portsmouth, Ohio

Chromalox electric . . . the heat of the future is here:

Brookside School
Kingsport, Tennessee

Richland Township School
Anderson, Indiana

Windsor Elementary School
Longstown, Pennsylvania

Bell School
Niles, Michigan

St. Ambrose School
Seymour, Indiana

Braceville Elementary School
Newton Falls, Ohio

Beaver Dam School
Beaver Dam, Ohio

Lexington Elementary School
Addition
Lexington, Ohio

For year-round comfort . . . safety . . . economy . . . CHROMALOX . . . First in electric heat

More and more plans for modern schools make no provision for a boiler room. Instead, the space and dollar savings realized from low original cost Chromalox electric heating equipment is used to plan additional rooms and other facilities. With electric heat, total *operating* costs can be lower, too. We can give you case history proof.

And what price tag do you put on safety . . . or on true year-round comfort? With Chromalox electric heat, you get individual room control, elimination of down drafts, fresh air ventilation and natural cooling.

The Chromalox electric way is also the easy, economical way to replace worn out heating systems in present schools, and plan heat for school expansions.

Don't plan modern facilities around an old fashioned boiler room. Send today for Bulletin 990B . . . "The Dollars and *Sense* Story of Heating Schools Electrically."

4990

CHROMALOX
Electric Heat
INDUSTRIAL • COMMERCIAL • RESIDENTIAL
EDWIN L. WIEGAND COMPANY
7637 Thomas Boulevard • Pittsburgh 8, Pa.

Don't Tie Yourself Up In Excess Tape

Save Money with Dutch Brand's new Plastic Electrical Tape in 44-ft. Rolls

Dutch Brand's new 44-ft. roll of Plastic Electrical Tape costs no more per foot than a 66-ft. roll. To you, this means less funds sunk in inventory. It also means you are *not* tied up in excess tape footage that invites waste and pilfering.

Dutch Brand Plastic Electrical Tape is the easy, *better* way to do scores of electrical maintenance jobs. It's thin, strong, flexible . . . provides a dielectric strength of 9,000 volts. Also provides unusual resistance to acids, alkalies, oils, solvents, fungus, bacteria, and gases. Made to highest industry standards. Available in 20'—44'—66' rolls. Order Dutch Brand Plastic Electrical Tape from your supplier today.

WRITE FOR NEW BOOKLET!

Looking for new ideas on tape as a money-and-time-saver? Ask for "Big Four in Electrical Tapes."

Johns-Manville Dutch Brand Division, 7800 South Woodlawn Avenue Chicago 19, Illinois

JOHNS-MANVILLE JM PRODUCTS

JOHNS-MANVILLE

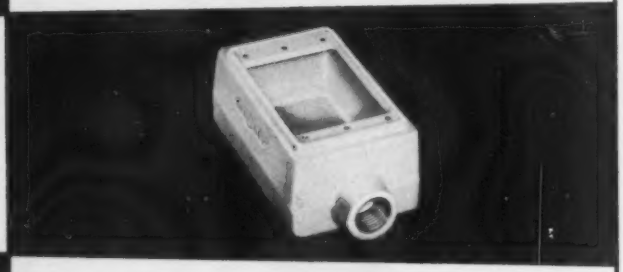
Cut costs... without cutting corners! Specify... GEDNEY CONDUIT BODIES

Gedney Conduit Bodies mean lowest installed cost! That's because they are skillfully made of tough, *malleable* iron, then hot-dip galvanized, and finally, they must pass the toughest inspection. Accurate machining and threading assure easiest installation . . . ruggedness assures longest service life!

THE GEDNEY CONDUIT BODY LINE INCLUDES ALL TYPES—SIZES ½" TO 4"

TYPE LB—Threaded—for heavy-wall rigid conduit. Use them with Gedney entrance fittings, straps, clamp backs to get an *entire* conduit system that is hot-dip galvanized.

TYPE FS—Threaded—shallow bodies for heavy-wall rigid conduit. Hot-dip galvanized finish prevents corrosive deposits—means easier installation, longer life.



SCORES OF OTHER GEDNEY FITTINGS are available for every purpose—all carefully designed, manufactured and inspected to assure economical installation and maximum customer satisfaction.

GEDNEY FITTINGS FIT

GEDNEY
ELECTRIC COMPANY

GEDNEY

RKO BLDG., RADIO CITY, NEW YORK 20
Foundry, Factory and Shipping Point: Terryville, Conn.

Balance...

what does it mean in cable?

Plenty! No one characteristic alone determines good cable. It's the right balance of many qualities that counts. Carol *has* this balance. Look at these significant test results.

	BRAND			
	CAROL	A	B	C
Electrical Insulation Resistance (1)	100	17	16	68
Cold Bend °F (2)	−50	−45	−90	−50
Abrasion Resistance (1)	91	62	100	92
Ozone Resistance (1)	100	6	18	12

Note: (1) 100 indicates best—others % of best (2) cold bend—actual test temperature

As can be seen, needlessly high cold flexibility can be built into cable . . . but only at the sacrifice of more important electrical properties. And in Brands A, B and C you will also note the lack of balance between abrasion resistance and ozone resistance . . . which means these cables can crack long before they wear out.

Carol, on the other hand, has not only the highest *combined* rating but is also the best *balanced*. As a result of years of experience and research, primary emphasis has been placed on the characteristics most vital in cable life and performance.

To you, this means superior quality *throughout* . . . *extra* quality and performance where it is most needed.

when you call for cable— call for

Carol®

PORTABLE CORDS • POWER SUPPLY CABLE • CONTROL CABLES • WELDING CABLE • GOVERNMENT TYPES • CORD SETS

Announcing the complete new line of HONEYWELL AUTOMATIC FIRE ALARM SYSTEMS

W247 Panel for the ultimate in detection and alarm for safe evacuation in buildings of all sizes. The panel features large bell capacity—up to 5 bell circuits operating a total of up to 50 bells. Choose from 3 types of alarm: *continuous ringing* (bells ring continuously to sound alarm), *master coded* (bells ring in code to distinguish fire alarm from other bells in building), *selective coded* (bells ring in code to identify fire location).

This panel features supervision of both the detection and alarm circuits. A built-in trouble buzzer saves you time and money during installation. Terminals are provided for connecting a remote trouble bell.

W237 Panel for maximum protection of property and the ultimate in fire alarm reliability. The system is available with standby battery operation so that the alarm will sound even during a power interruption. This system is so foolproof that it can sound the fire alarm even with a double break or ground in the detector wiring.

The detection circuit is completely supervised, and two independent alarm circuits are provided. A system of numbered lights on the front of the panel quickly and positively indicates the fire location. Both the detection and the alarm circuits are low voltage.

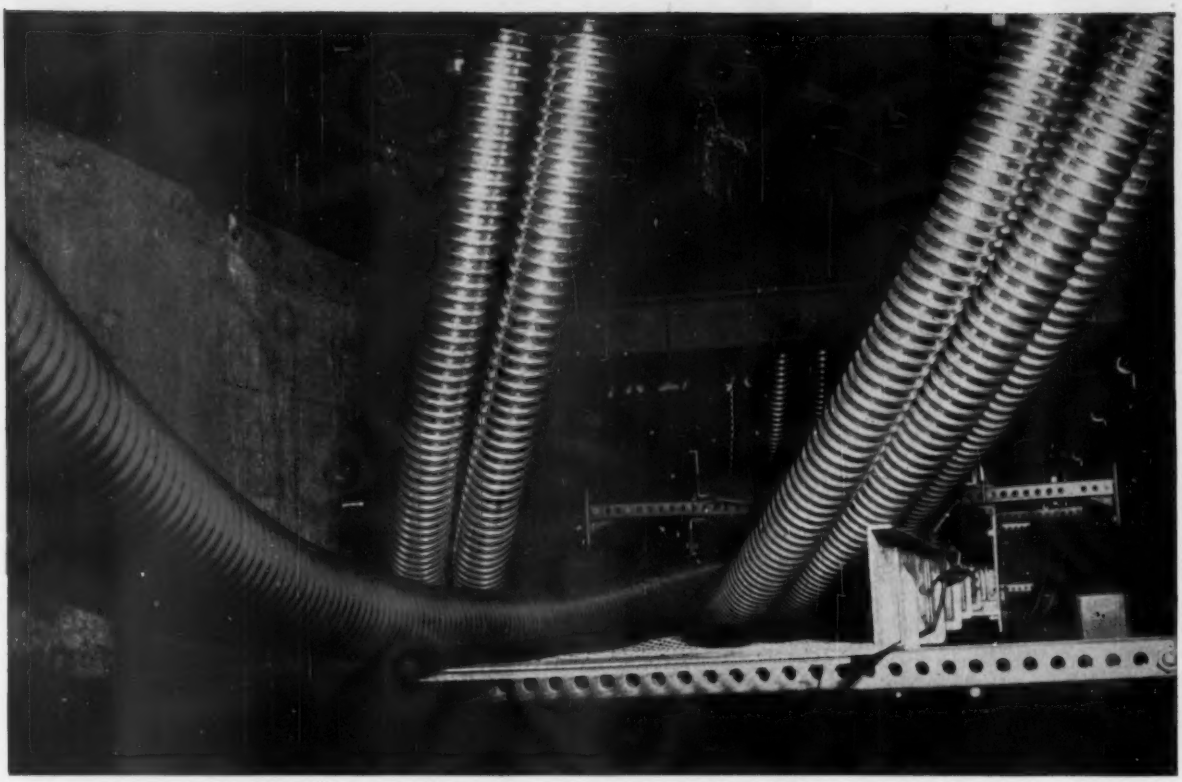
NOW HONEYWELL announces a brand new family of automatic fire alarm panels—the W247 line. This new W247 series has been added to the W237 family to greatly broaden Honeywell's line of automatic equipment. Now there are Honeywell panels and accessory equipment to meet virtually all of your customer's requirements. And all Honeywell panels are U.L. approved.

When you choose Honeywell fire alarm equipment you get other benefits too. Honeywell's extra services reduce your costs. Your local Honeywell office gives you fast, capable assistance in application, installation and final checkout. And Honeywell saves you service headaches by providing free service for one year.

For more information, call your nearest Honeywell office, or write: Minneapolis-Honeywell, Dept. EC-3-57, Minneapolis 8, Minnesota.

Honeywell

H HONEYWELL *First in Control*



Quick identification for high voltage primaries is provided by an Okonite-developed, baked-on enamel finish in bright orange. In this access tunnel below transformer enclosure 3/c 15kv Okonex primaries are laid in same tray with 3/c 600v Okonex secondaries with plain aluminum Loxarmor. Plant and electrical system were engineered and designed by Southwestern Engineering Company. Electrical contractors were Trowbridge & Flynn Electric Company.

"Power supply is vital," said Diamond Gardner Corp.
"We furnished Okonite cables," said Del E. Webb and SWECO

Here was an ultra-modern, completely integrated manufacturing operation where power failures could trigger a costly "chain reaction" in down time. That's one reason why Del E. Webb Construction Company and Southwestern Engineering Company furnished Okonite cables for extensive use in the new and unique mechanical pulping mill for Diamond Gardner Corporation's Integrated Forest Products Center at Red Bluff, California.

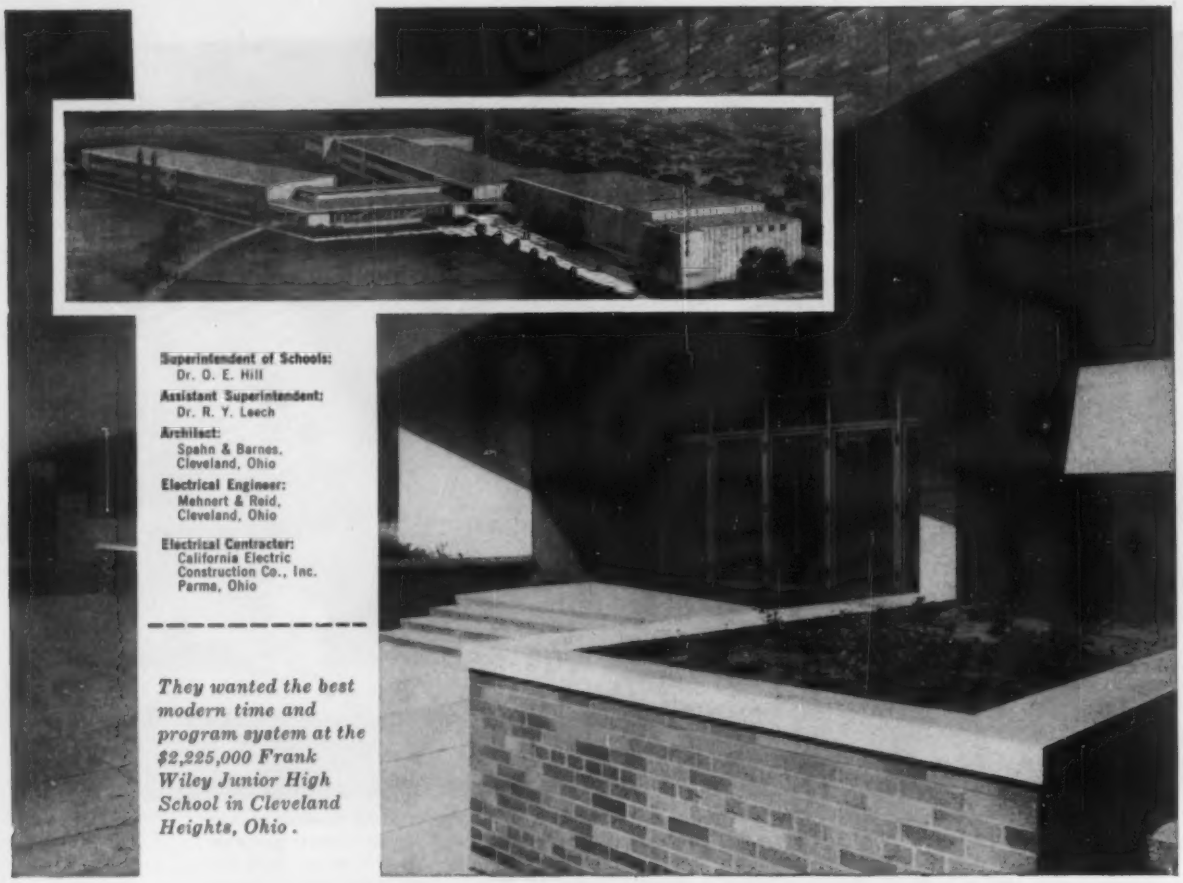
Another reason was SWECO's knowledge that The Okonite Company, because it alone makes cables by all methods, is uniquely qualified to help select the best cable for a specific circuit . . . and manufacture it to suit any installation conditions.

All primary and secondary power and control circuits in the plant are Okonite cables. For example: lightweight Okonex-insulated Loxarmor primaries, identified by an Okonite-developed bright orange, baked-on enamel finish, carry all power at 12kv to the twin transformer vaults in the plant. 600-volt Watertite-Loxarmor, 600-volt Okonex-Loxarmor and 5kv Okonex-Loxarmor, in racks, were selected for secondary distribution for their flexibility, low installation costs and the ease with which circuits can be added or re-routed. 600-volt Okotherm control cables were specified for circuits where high heat conditions are encountered.

Okonite quality . . . Okonite's ability to build cables by any method . . . and Okonite's expert design and installation assistance are factors to consider when ordering or specifying cables for your important installations. For more data on Loxarmor, write for free, 36-page Bulletin EC-1090, The Okonite Company, Passaic, New Jersey.

where there's electrical power . . . there's **OKONITE CABLE**

6214



Superintendent of Schools:
Dr. O. E. Hill

Assistant Superintendent:
Dr. R. Y. Leech

Architect:
Spahn & Barnes,
Cleveland, Ohio

Electrical Engineer:
Mehnert & Reid,
Cleveland, Ohio

Electrical Contractor:
California Electric
Construction Co., Inc.
Parma, Ohio

They wanted the best modern time and program system at the $2,225,000 Frank Wiley Junior High School in Cleveland Heights, Ohio.

They chose a STROMBERG Time and Program System

FEATURES OF STROMBERG SYSTEMS INCLUDE:

- Jeweled Master Clock movement with automatically wound 72-hour spring power reserve.
- Secondary Clocks standard with hourly and 12-hour supervision—correction cycles completed in *only 60 seconds.*
- Program Unit, capable of 1440 signals daily on each circuit, immediately resets following power interruption.
- Central operations panel for control of utilities.
- Seven-channel transmitter—one for clock supervision, six for program signals.
- Installation and maintenance service available throughout U.S.A. and Canada.

A product of the laboratories of one of the largest clock manufacturers in the world—YOUR GUARANTEE of performance, quality and dependability.

A complete catalog—TIME AND SIGNAL EQUIPMENT—prepared especially for Architects and Engineers—is yours for the asking.

Stromberg TIME CORPORATION

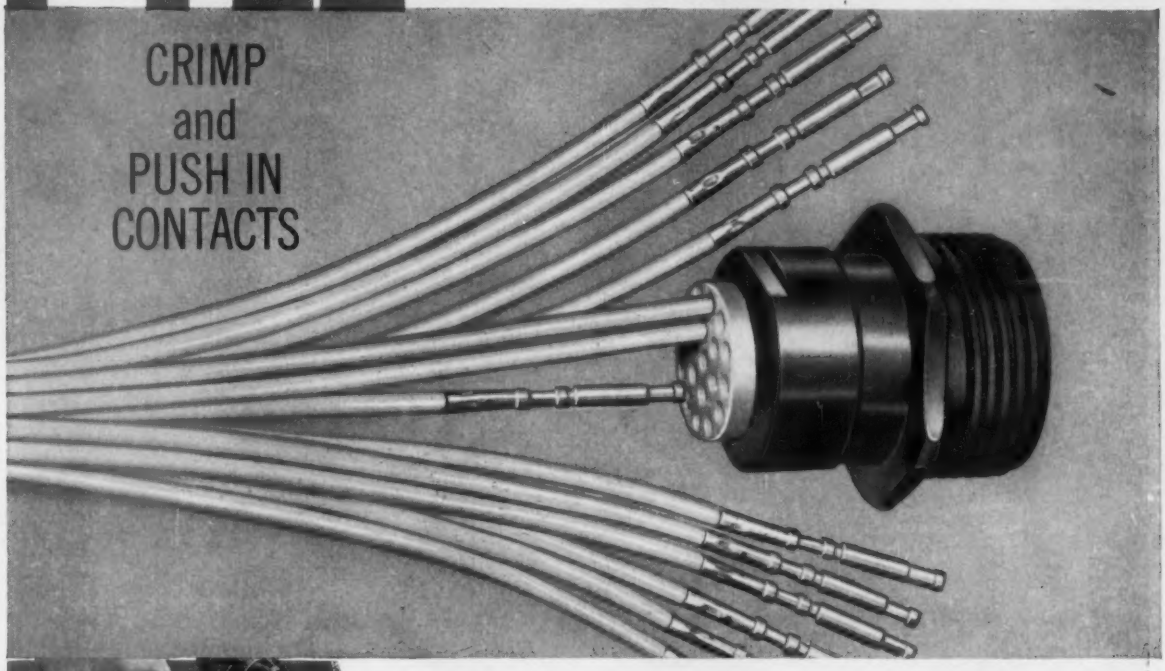
GT GENERAL TIME

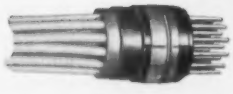
SUBSIDIARY OF GENERAL TIME CORPORATION

Sales & Service Offices throughout the U. S. A.

PYLE-STAR-LINE® CONNECTORS

WITH NEW MOD. 2 INSERTS FOR HIGH-SPEED, RELIABLE TERMINATION





Mod. 2 Insert, 19-Pole
with metal housing removed

1. Individual contacts are crimped to wires outside connector by a semi-automatic tool, then, for assembly, inserted one by one into insulation with crimped joint intact.

2. Contact retention ability of resilient insulation exceeds the requirements of MIL C-5015-D even after many reassemblies.

3. Failures due to faulty wire termination are eliminated by the single crimped joint which is stronger than the wire itself . . . and superior mechanically and electrically to a solder joint.

4. Simplicity of wire termination greatly reduces errors in circuitry. Changes in circuitry are simple and speedy.

5. Up to 100 poles for wires sizes 16, 12 or 10, with no sacrifice in environmental resistance, or ability to meet and exceed MIL C-5015-D in Class A, B, C, E and R.

6. *Two-piece Mod. 2 insert* is interchangeable within Standard Pyle-Star-Line barrel shells with *three-piece Mod. 1 insert.*
Mod. 1 inserts for wire sizes up to 4/0 are available for disconnect and for current rupturing service.

Environmental Limits of Pyle-Star-Line connectors	
Temperature	—80 F. to 225 F.
Pressure	300 PSI External, 200 PSI Internal
Chemical Resistance	Most acids, most alkalis, oil
Corrosion Resistance	Salt Spray: 300 days without failure
Dust Resistance	Exceed requirements of MIL C-5015D
Shock Resistance	50G Minimum
Vibration	Exceed 20G to Method II of Mil C-5015D
Humidity & Moisture Resistance	Exceed Class E. Spec. of Mil C-5015D
Air Leakage	Meet Class E Spec. of Mil C-5015D

THE PYLE-NATIONAL COMPANY
WHERE QUALITY IS TRADITIONAL

Write for complete specifications:

1344 North Kostner Avenue, Chicago 51, Illinois

Branch Offices and Agents in Principal Cities of the U.S. and Canada
Railroad Export Department: International Railway Supply Co., 30 Church St., New York 7, N.Y.
Industrial Export Department: Rocke International Corp., 13 E. 40th St., New York 16, N.Y.
Canadian Agent: The Holden Co., Ltd., Montreal

CONDUIT FITTINGS • MOTOR CONTROLS • SWITCHES • LIGHTING FIXTURES • FLOODLIGHTS

Steady plant production demands dependable power cable . . .

HABIRITE-HABIRPRENE CABLE gives unexcelled performance!

To help assure uninterrupted production, modern industrial plants require reliable cables for delivering electric power to production lines. The service reliability of Phelps Dodge *Habirite-Habirprene* is unsurpassed by any other rubber insulated neoprene jacketed type RR cable.

Habirite-Habirprene is a combination of specially engineered butyl rubber insulation and neoprene jacket. The overall features of this cable provide greater resistance to heat, oxidation and ozone; improved electrical properties, including superior insulation resistance; higher copper operating temperature; superior flexibility; improved mechanical toughness against damage from installation hazards and extra resistance to corona, an absolute necessity for high-voltage neoprene jacketed cable.

As a general purpose cable, *Habirite-Habirprene* assures the utmost in safety, durability and reliability.

See Your Phelps Dodge Distributor!

PHELPS DODGE COPPER PRODUCTS CORPORATION

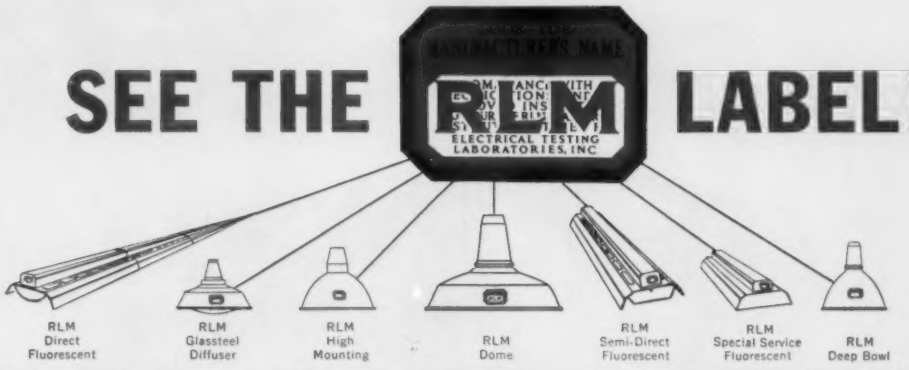
PD

SALES OFFICES: Atlanta, Birmingham, Ala., Cambridge, Mass., Charlotte, Chicago, Cincinnati, Cleveland, Dallas, Dayton, Denver, Detroit, Fort Wayne, Greensboro, N.C., Houston, Indianapolis, Jacksonville, Kansas City, Mo., Los Angeles, Memphis, Milwaukee, Minneapolis, New Orleans, New York, Philadelphia, Pittsburgh, Portland, Ore., Richmond, Rochester, N.Y., San Francisco, St. Louis, Seattle, Washington, D.C.

Either it is RLM APPROVED or it is NOT!

The ONLY WAY to be SURE is to

SEE THE RLM LABEL!



There is NO SUCH THING as an RLM "TYPE" Fixture

According to the new, higher I.E.S. Recommended Industrial Lighting Levels, 80% of present industrial lighting is now obsolete. This makes RLM quality concepts of lighting equipment design, performance and maintenance features more important than ever.

You can't have quality lighting without quality lighting equipment!

There are those who claim a lighting unit to be "just as good" as an RLM-labeled unit. It may even LOOK like an RLM unit. But the only proof positive is the RLM Label itself — the only evidence that the unit is RLM approved.

Why there is NO SUCH THING as an RLM "Type"?

The RLM Label on fluorescent and incandescent lighting units, first of all, assures the buyer of design and construction that meet the RLM Institute's high standards of quality. However, he also receives a Warranty of Uniform Quality because of the Inspection System back of every RLM-labeled unit. This Inspection System assures the buyer that each and every fixture labeled will uniformly meet the quality RLM standards.

How RLM Checks Uniformity of Quality

RLM testing and inspection procedures require that representatives of the Electrical Testing Laboratories periodically visit plants of all RLM Member-manufacturers. They take lighting fixtures right off the assembly lines and out of stock for testing and inspection at their laboratories. They may also obtain test samples directly from the distributors' shelves or out of contractors' stocks on the job in order to check Uniform Quality at every level of distribution.

This activity of the RLM Standards Institute, which makes possible the Warranty of Uniform Quality, is not duplicated by any other agency in the lighting industry. That is why there is no such thing as an RLM "Type" Lighting Unit.

Uniform Quality as assured by the RLM Label does not mean that all RLM fixtures made by the various manufacturers are alike in quality. Quite the contrary, each manufacturer engineers into his RLM-labeled fixtures such other advancements in design and quality which he deems important to quality performance. Uniform Quality refers to the labeled fixtures delivered to the buyer by the manufacturer.

Uniform Quality Essential to Finest Performance

This quality uniformity in delivered fixtures is essential to uniformly satisfactory lighting equipment performance. It assures that each unit in the system performs with equal efficiency to the other . . . that ballasts function with uniform efficiency . . . that the reflection factor be uniform from unit to unit . . . that the units be of uniformly durable construction with the identical-gauge steel and the same thickness Porcelain Enamel. Such uniformity reduces to a minimum the plague of spotty performance by individual units in a lighting system.

FREE SPECIFICATIONS BOOKLET! FREE I.E.S. Industrial Lighting Recommendations!

These two publications are a must to anyone planning lighting or re-lighting projects of industrial plants and utilitarian locations. Contains all RLM Specifications. For a complimentary copy write: RLM Standards Institute, Inc., 326 W. Madison St., Suite 8193 Chicago 6, Ill.

R-526

Every RLM Unit Must Conform with High-Quality Standards such as these:

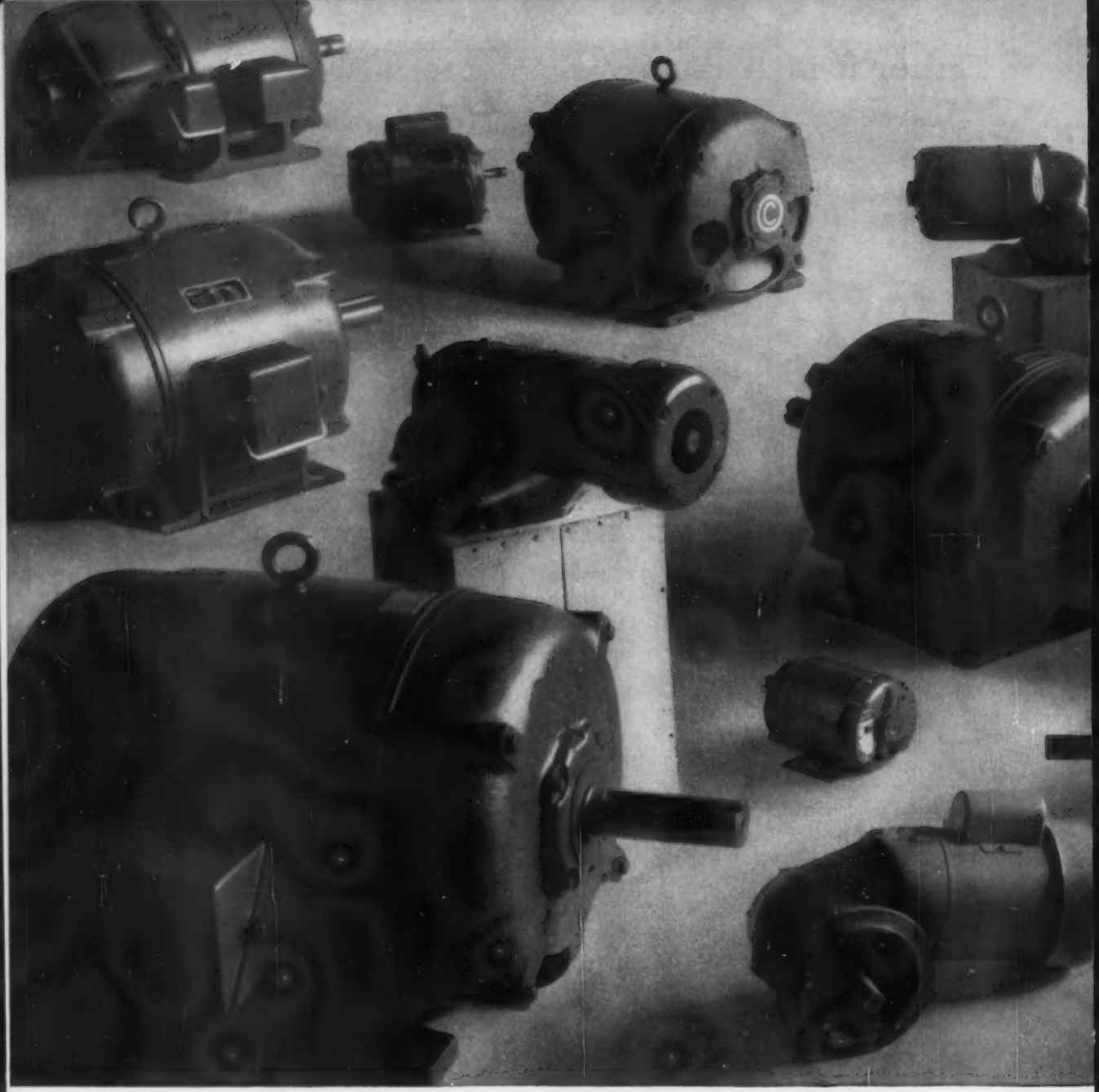
Porcelain Enamel Reflectors — all porcelain enamel RLM Units must have a specified thickness of Genuine Porcelain Enamel fused to steel. This unsurpassed high-reflection, high-diffusion reflecting surface is the only commercially available finish that cannot deteriorate or corrode. Simple soap-and-water cleaning quickly restores it to original efficiency.

High-Quality Ballasts — RLM Fluorescent Units must be equipped with Certified Ballasts which prevent high-temperature ballast operations, supply proper starting current, maintain proper operating watts to the lamp. Because of their high power factor, present wiring capacity can be utilized most efficiently.

Reflector Design — every RLM Unit must conform with the approved principles of Illuminating Engineering. Such design protects the workers' eyes while delivering, not only the most light per dollar, but also the required quality of light for the individual seeing task.

Sound Construction — RLM Units must comply with high fabrication and materials to insure standards of maximum resistance to sag, distortion and breakage.

RLM STANDARDS INSTITUTE



How to give your customer more than a motor

You can solve all motor problems with

You can make your job easier by selling Century Electric motors, 1/20 to 400 hp. Here's how:

Easy ordering—You save time because you can give your customer answers to all his motor problems from one source, and you save him valuable time (and money) because he doesn't have to shop around for motors. He'll appreciate it. When he asks about motors he knows you have the answer.

Fast shipments—From Century Electric's complete stock you can get a motor for any standard application and a quick answer for your customer. In addition, motors are packed in sturdy boxes so when you reship to your customer you know he will get motors in good condition.

Century Electric's line . . . 1/20 to 400 hp

Application know-how—But you want to be sure he has the right motor for the job. And if you need help on this, you get expert back-up from your nearest Century Electric sales engineer. He knows motors inside and out because he sells, applies and thinks nothing but motors day after day.

This is why you can give your customer more than just a motor—a quality product backed by application know-how and the ability to furnish fast answers from one source.

CENTURY ELECTRIC COMPANY

St. Louis 3, Missouri *Offices and Stock Points in Principal Cities*

Century

58-7

Check unmarked terminals.

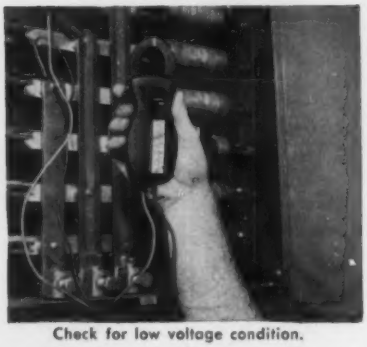
handle 99% of all your test needs with the ALL-PURPOSE AMPROBE RS-3

Check resistance of transformer windings of ballast.

Check resistance of motor control solenoid coil.

Use as continuity tester to determine if fuse is good.

Balancing circuits.



Check for low voltage condition.

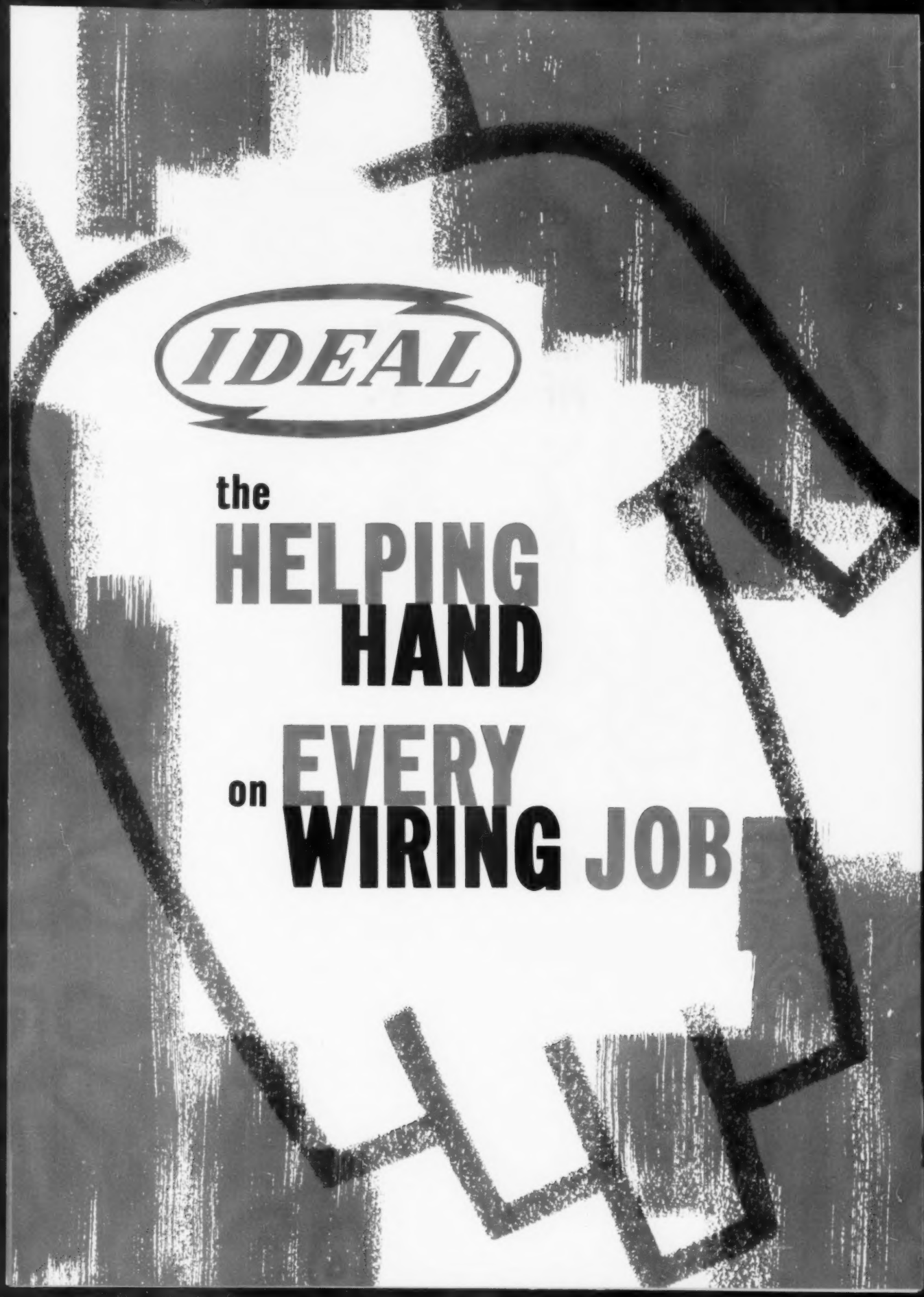
There's only one way you can do it . . . with the new AMPROBE RS-3 . . . the only tester small enough to fit in your pocket, yet versatile enough to measure volts, amps, and OHMS!

Meets every commercial voltage requirement on three voltage scales . . . 0-150/300/600 volts ac. Accurate current readings from 0 to 300 amps on five current ranges. The ohmmeter scale is designed specifically for you . . . readings as low as 0.5 ohms can be taken, enabling you to readily distinguish the difference between short circuits and actual coil resistances.

Doesn't it make a helluva lot more sense to use this one all-purpose instrument than to tote *three* separate testers that can't even come close to AMPROBE efficiency?

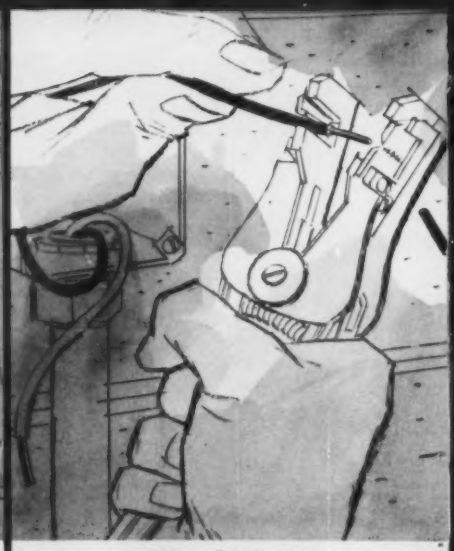
NEW AMPROBE RS-3

Pyramid Instrument Corporation, Lynbrook, N. Y. In Canada: Atlas Radio Corp., 50 Wingold Ave., Toronto


IDEAL
the
HELPING
HAND
on EVERY
WIRING JOB

Wire Pulling

Wire Lubrication



Wire Stripping

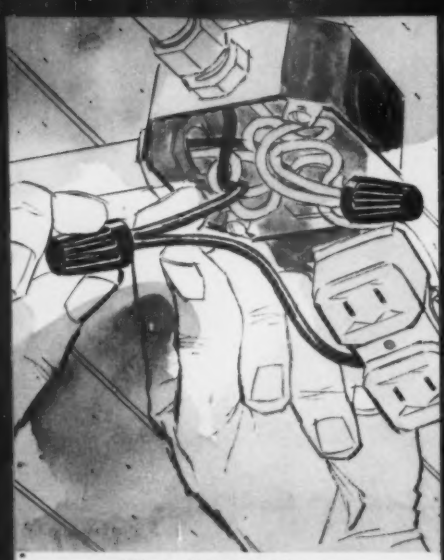
IDEAL

TOOLS MAKE AND

From the makers of the original "Wire-Nuts" wire connectors comes a complete line of carefully engineered and constructed tools to make the electrician's job safer, easier and more efficient.

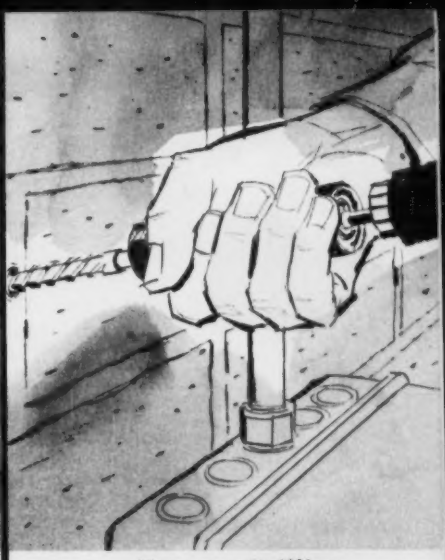
Truly an extra hand on any wiring job, IDEAL tools are simple to use and inexpensive, yet meet highest safety standards. Planned for specific needs, IDEAL tools help the electrician avoid skinned knuckles, damaged insulation, kinked wires, and exasperation.

IDEAL supplies everything from drills for cutting through masonry walls, right up to maintenance equipment such as fuse pullers and circuit testers.



Wire Connecting

Circuit Testing



Masonry Drilling

THE ELECTRICIAN'S JOB SAFER EASIER FROM START TO FINISH

Tough muscle-straining jobs like pulling wire through long runs of conduit become amazingly simple with IDEAL fish tape, reels and pullers. For exceptionally difficult jobs, a little IDEAL "Wire Lube" lubricates the wire for slick, speedy pull through. IDEAL wire guides protect insulation from rough conduit edges and help assure meeting of rigid codes and standards.

To finish the job, IDEAL supplies wire strippers, pliers, and cable strippers and varieties of wire connectors to fit every electrician's preference, be it "Wrap-Cap" crimp connectors, set-screw connectors or "Wire-Nuts" connectors.

get IDEAL tools through your local electrical distributor

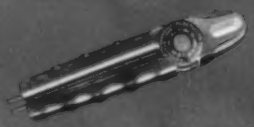
Fish Tape, Reel and Winder
IDEAL fish tape on easy-to-grip reel and puller gives save positive grip without danger of bending or kinking. Shown with optional winder.

"Wire Lube"®
Apply by hand or brush as cable is pulled into conduit. Protects insulation. Dries quickly to a fine powder. No residual sludge.

"Test Glo"
For testing circuits, motors, fuses, etc. Neon test lamp at front of handle, glows on voltages from 80 to 600 volts a-c or d-c.

T-Type Wire Strippers
Easy-to-Use and inexpensive, strips, cuts and loops wires from 10 to 26 gauge cleanly, quickly and easily.

Stripmaster
Strips both solid or stranded wire in just one 2-second squeeze. Won't nick wire or crush wire ends. Available for gauges 8 through 30.



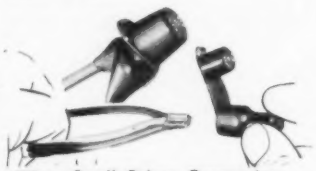
Fuse Puller & Testlite
Dielectric plastic molded grips make fuse pulling safe and effortless. Test prods on opposite end fit parallel and tandem slot receptacles.

Continuity Tester
Battery powered, pocket sized unit does away with need to apply line voltage to unknown or untested circuits. For testing control panels, communication equipment, etc.

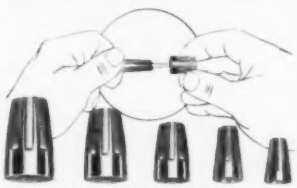
Voltage Tester
Double protection solenoid indicator moves on easy-to-read calibrated scale. Neon lamp operates separately, shows type of current. Built for working electricians' use.

Cable Ripper
Rips outer sheath from non-metallic cable up to ½ inch O.D. quickly and easily. Formed grip and rigid construction assure straight cut. Replaceable steel blade.

Electricians Pliers
This all-in-one tool serves both as a crimper for Ideal Crimp Connectors **and** as a rugged, pair of electricians pliers. Twists, cuts wire—deburrs conduit.



"Wrap-Cap" Crimp Connector
Insulates all around the electrical joint and between the wires. Gives double thickness protection over sleeve and wire ends. 600 V. listing for pressure cable connectors, branch and fixture.



"Wire Nut" Connectors
The simplest, safest way to make pigtail splices. Just screw "Wire-Nuts" on like a nut on a bolt. No solder or tape needed. 600 V. listing for pressure cable connector, branch and fixture.

IDEAL INDUSTRIES, INC. 1041-C Park Avenue, Sycamore, Illinois

IDEAL

Gentlemen,

Please send catalog sheets and promotional information on the following tools.

- ☐ "Wire Lube"
- ☐ "Test-Glo"
- ☐ Cable Ripper
- ☐ "Stripmaster"
- ☐ T-Type Wire Stripper
- ☐ Electricians Pliers
- ☐ Continuity Tester
- ☐ Voltage Tester
- ☐ Fish Tape, Reel and Winder
- ☐ Fuse Puller and Testlite
- ☐ "Wrap-Cap" Crimp Connector
- ☐ "Wire-Nut"Connectors

Buy These IDEAL Tools Through Your Local Electrical Distributor

NAME_____ TITLE_____

COMPANY_____

ADDRESS_____

CITY_____ ZONE_____ STATE_____

Form No. I-228

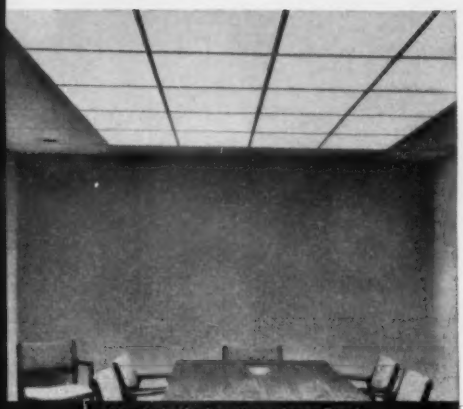
Printed in U.S.A.

Airways Sales Office . . Recessed Luminaires

Now...a Nationwide Trend to **HOLOPHANE** 2 Ft. Square Prismalume* Controlens*

- **Setting New High Levels of Fluorescent Lighting Efficiency**
- **Maximum Light Control... High Output...Low Brightness**
- **Sparkling Appearance**

Bank Offices: Continuous Runs; Hinged Frames



Director's Meeting Room: Large Panel

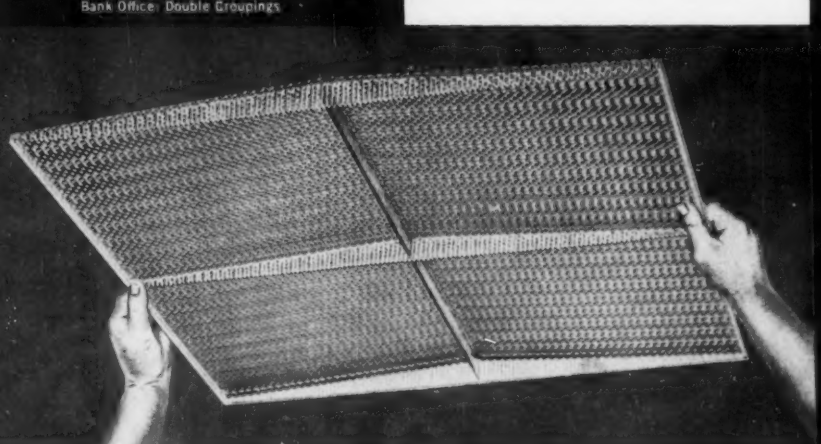
Day by day, increasing numbers of important fluorescent installations feature HOLOPHANE—2 Ft. Square PRISMALUME CONTROLENS... The range of application is wide: offices, banks, stores, lobbies, schools, salesrooms...Equally varied are the forms of luminaires: in large ceiling panels, in continuous runs, in groupings...Wherever it is used this CONTROLENS creates the pleasant feeling that something new and different has been achieved in lighting. Made of Prismalume (acrylic plastic) it affords crystal clarity, color stability, lightness in weight, economical maintenance. The prismatic light controlling features (not mere diffusing elements) provide highest quality illumination, with visual comfort.

Write for Complete Engineering Data

Hotel Lobby: Large Panel

Bank Office: Double Groupings

Trust Co.: 4 ft. Square Surface-Mounted Luminaires



For Better Lighting Holophane *BE SPECIFIC...*

HOLOPHANE COMPANY, INC.

Lighting Authorities Since 1898 • 342 Madison Ave., New York 17, N. Y.

THE HOLOPHANE CO., LTD., 418 KIPLING AVE. SO., TORONTO 14, ONTARIO

NEW COOL SOLA SLIMLINE BALLAST

Sola ballasts guard your reputation with coolest coils and capacitors, easily pass "in-fixture" heat tests

Sola's new 650-110 ballast for two F96T12 or two F72T12 slimline lamps offers premium performance at only slight additional cost. This new CBM-certified ballast was tested in a totally-enclosed, four-lamp fixture mounted against fibrous acoustical material. Room ambient was 25°C. Maximum temperatures recorded were: case "hot spot" 86°C, capacitor 70°C. Each temperature was well within insulation limits and U.L. fixture requirements. Sola outperformed competitive, premium-priced ballasts tested under these same severe conditions. (Request Bulletin FL-356 for details and test results.)

Men who install, furnish, or specify fixtures know that "in-fixture" ballast performance is what really counts to the man who's buying the light and who insists on every lumen he's paying for. They know that Sola's all-CBM-certified ballasts give trouble-free, cool, efficient service . . . full light output and full ballast life.

Fixture manufacturers are invited to evaluate this new, cool slimline ballast (Cat. No. 650-110) in their own fixtures. Request test samples or Bulletin FL-356 from ***Sola Electric Co.,*** A Division of Basic Products Corporation, ***4633 W. 16th Street, Chicago 50, Illinois.***

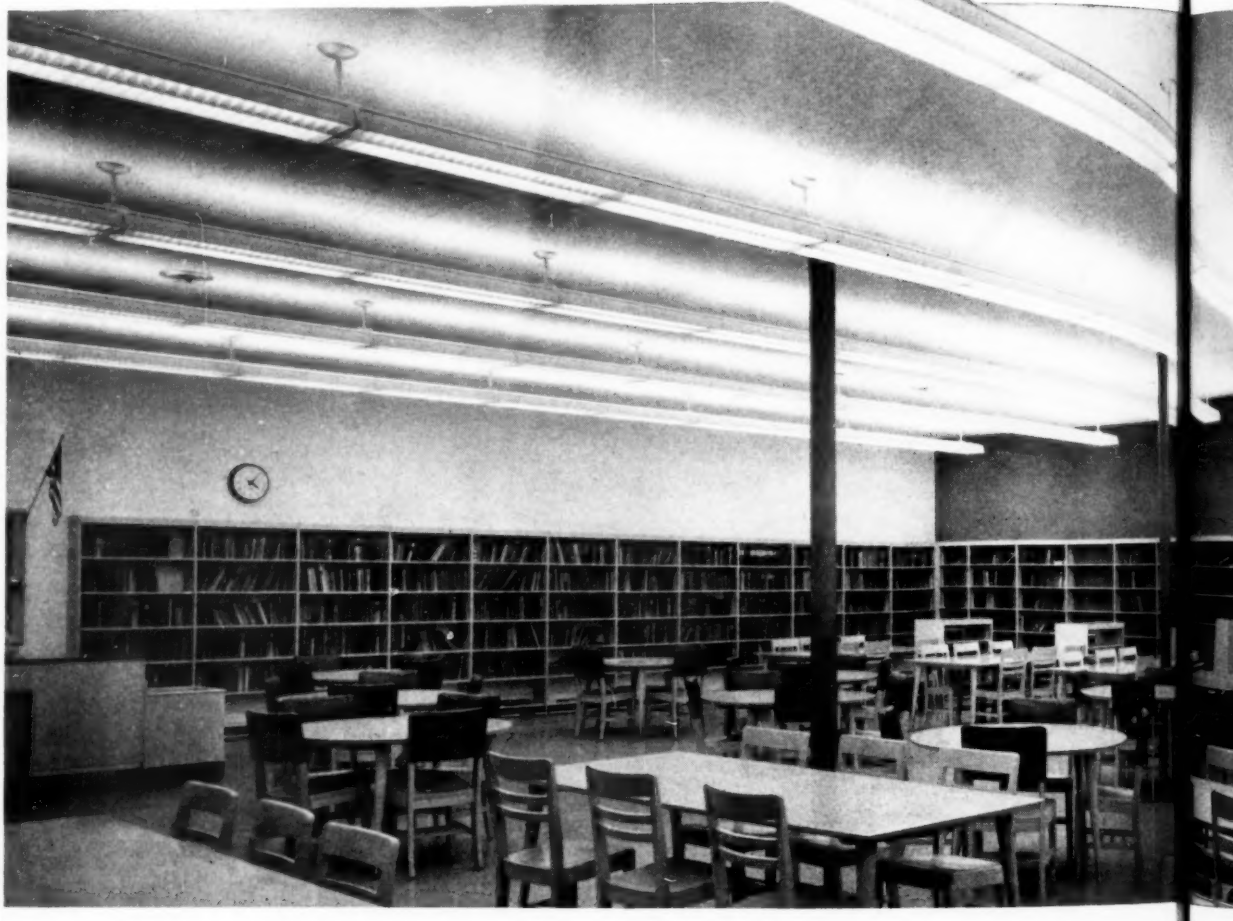
Now Available

Ballast Catalog No. 650-110
for two F96T12 or two F72T12
430 ma slimline lamps

Write for Data

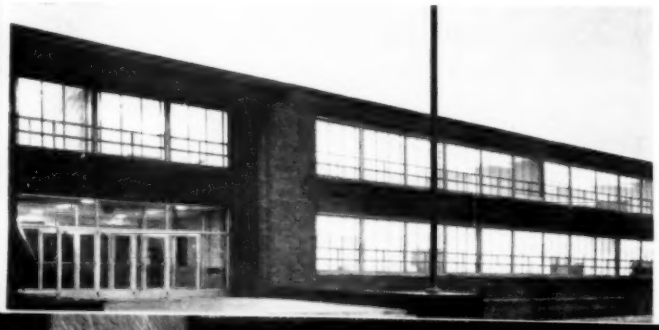
DAY-BRITE LUVEX®* 2-lamp fixtures
suspended with A-J®† Adjustable Hangers
—now, more than ever,
America's best school lighting value!

*Patent No. D-158,782 †Patent No. 2,446,736



Use Day-Brite Fixtures to get more school lighting jobs

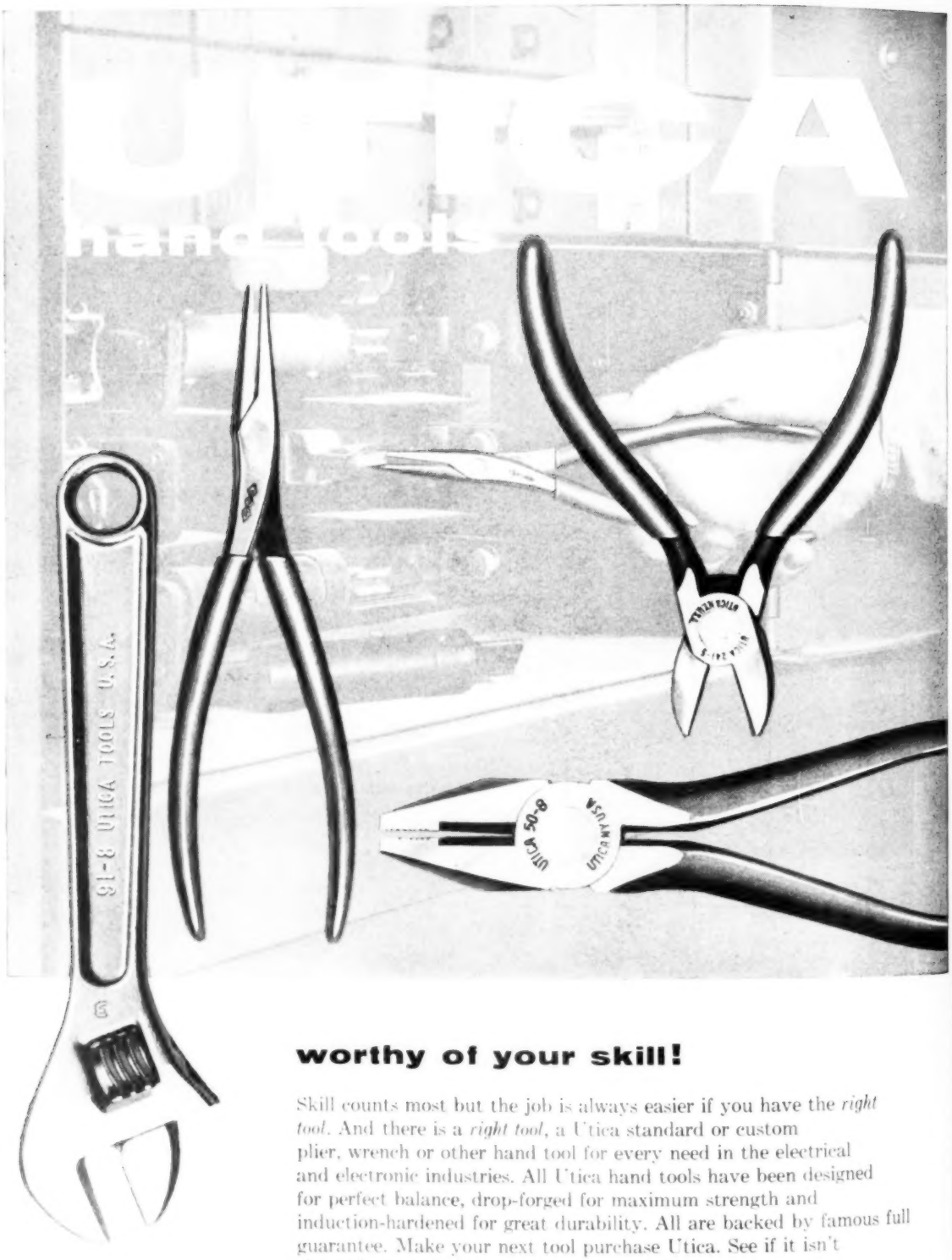
It's easy to see why a Day-Brite lighted school, such as this, usually leads to others. High-level, glare-free Day-Brite lighting in one school sets the standard for *other* schools in a community.



New lower prices on LUVEX make it easier than ever for schools to have Day-Brite lighting . . . particularly when you consider the savings in installation and maintenance costs possible with Day-Brite fixtures.

Plan now to get more school lighting jobs with Day-Brite equipment. Call your Day-Brite representative listed in the Yellow Pages of your phone book.

LINCOLN COMMUNITY HIGH SCHOOL, Lincoln, Illinois
ATKINS, BARROW & ASSOCIATES, Urbana, *Architects*
BROWN, MANTHEI, DAVIS & MULLINS, Champaign, *Consulting Engineers*
BRUNKOW ELECTRIC, Champaign, *Electrical Contractor*

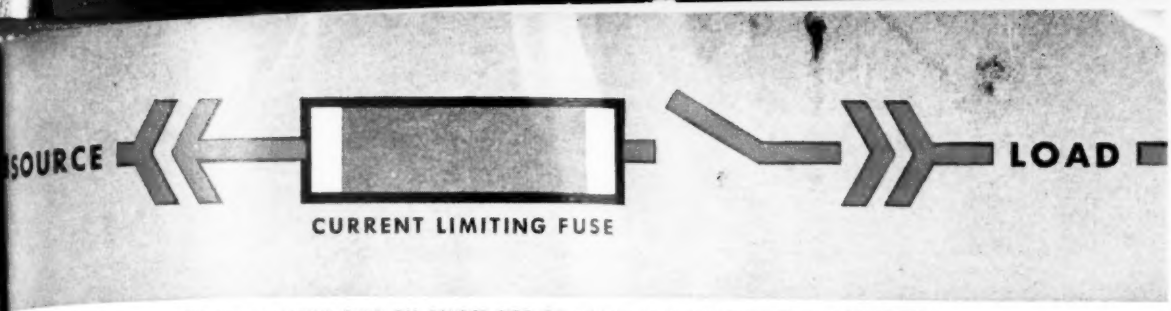


worthy of your skill!

Skill counts most but the job is always easier if you have the *right tool*. And there is a *right tool*, a Utica standard or custom plier, wrench or other hand tool for every need in the electrical and electronic industries. All Utica hand tools have been designed for perfect balance, drop-forged for maximum strength and induction-hardened for great durability. All are backed by famous full guarantee. Make your next tool purchase Utica. See if it isn't the tool you would have designed for the job.

USE **UTICA**...*the tools the experts use!*

Hallmark of Quality since 1895 UTICA DROP FORGE & TOOL DIVISION • KELSEY-HAYES CO., UTICA 4, NEW YORK



CURRENT LIMITING FUSE ON *SOURCE* SIDE OF SWITCH FOR SHORT-CIRCUIT PROTECTION

Improved protection with

General Electric ROLLOUT

Switch and Fuse Equipment

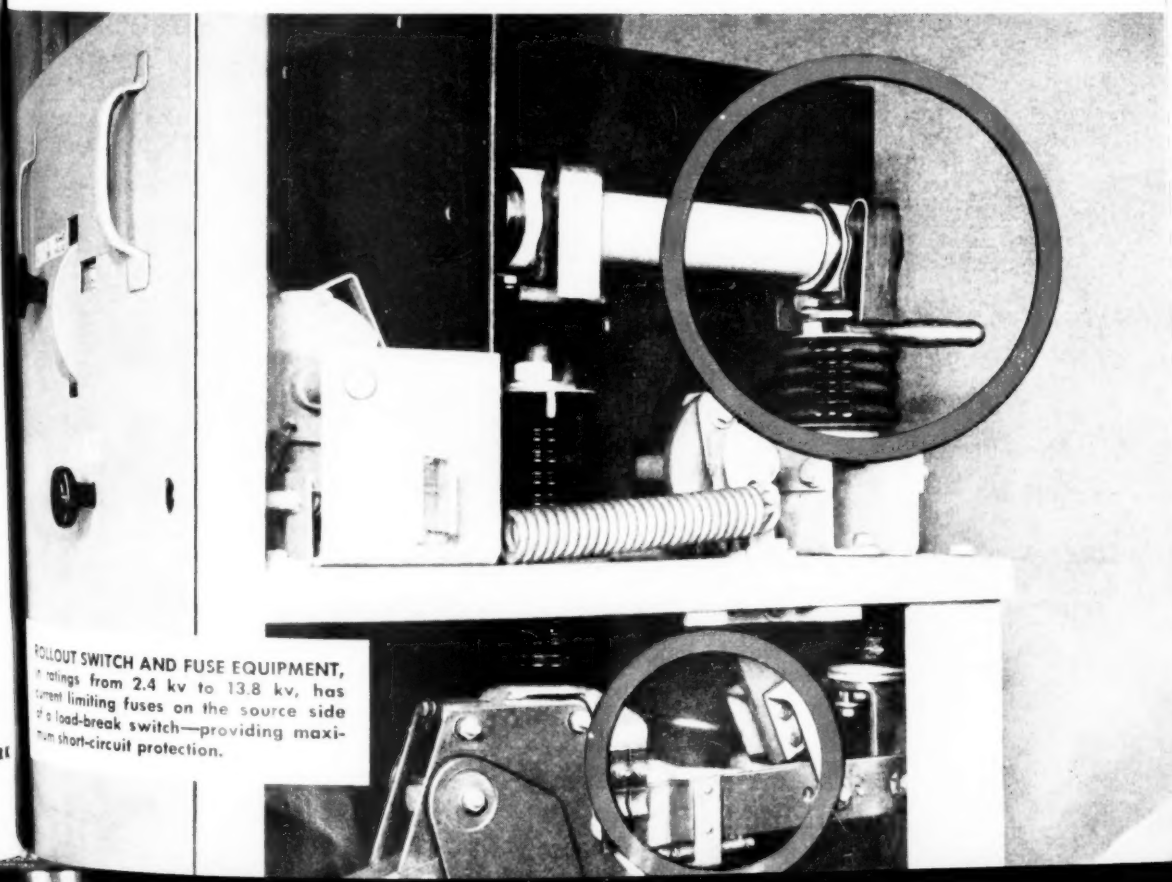
You get improved short-circuit protection with General Electric's new Rollout Switch and Fuse Equipment—because current limiting fuses are placed on the *source* side of a load-break switch.

You also get greater safety, easier maintenance and inspection, and installation versatility—with the new equipment's rollout feature.

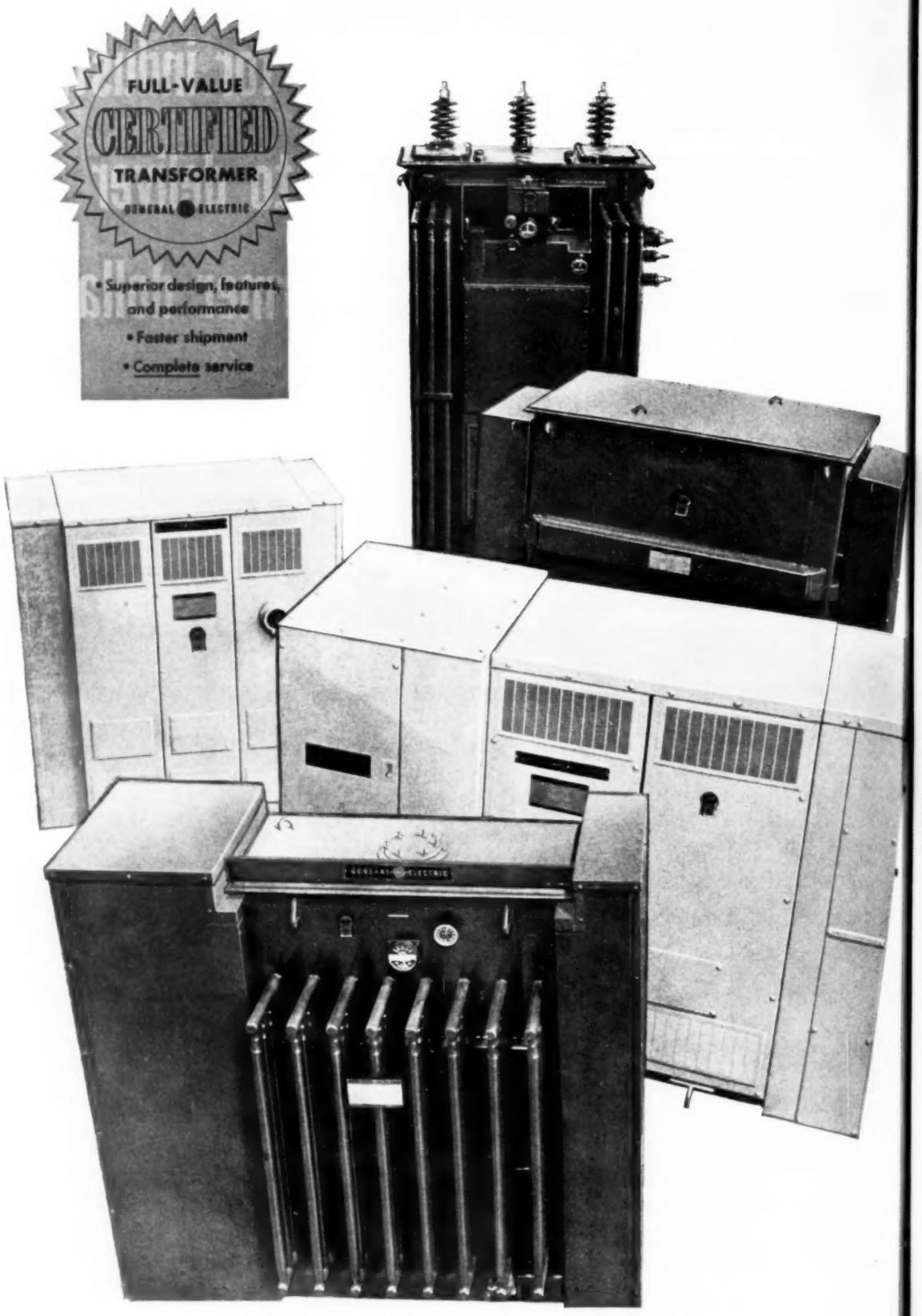
Call your nearest General Electric Apparatus Sales Office for more information or write for Bulletin GEA-6623, General Electric Company, Section L-514-3, Schenectady, New York.

Progress Is Our Most Important Product

GENERAL ELECTRIC



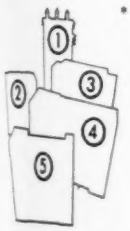
ROLLOUT SWITCH AND FUSE EQUIPMENT, in ratings from 2.4 kv to 13.8 kv, has current limiting fuses on the source side of a load-break switch—providing maximum short-circuit protection.


FULL-VALUE
CERTIFIED
TRANSFORMER
GENERAL ELECTRIC
• Superior design, features, and performance
• Faster shipment
• Complete service

General Electric transformers for industry* are CERTIFIED to deliver full value for your transformer dollar

When considering the purchase of your next transformer, we challenge you to examine the *complete "package"* offered by General Electric. Only when you evaluate all three—product, shipment, and service—can you be sure you get *full value* for your transformer dollar. To emphasize the importance of this over-all evaluation concept, General Electric has developed the Certified Full-value Transformer Program. G.E.'s full line of transformers for industry is certified to deliver full value in terms of superior basic design and features . . . plus faster order handling and shipment . . . plus complete service before, during, and after installation. Evaluate your transformer purchases in this way and we're confident you will recognize G-E superiority.

More than 70 years' experience in the transformer field stand behind the engineering, manufacturing, and research skills and industry-oriented business concepts which contribute to G-E transformer leadership. **Superior design, features, and performance** means that General Electric is first with major product developments such as interchangeable bushings, improved pressure-relief devices, advanced insulations, and lower sound level research. **Faster shipment** means that combined benefits of a large force of G-E sales engineers, computer design capabilities, and repetitive manufacturing facilities result in substantially shorter shipping cycles. **Complete service** by a staff of field-based General Electric application and installation engineers and a network of 50 conveniently located service shops is unduplicated anywhere in industry today.



* 1. Medium transformers (501 to 7500 kva)
2. Open dry-type transformers (300 to 7500 kva)
3. Sealed dry-type transformers (300 to 7500 kva)
4. Integral Distribution Centers
5. Distribution Equipment transformers (112½ to 500 kva)

For complete information and application help on General Electric Certified Full-value Transformers for Industry, see your G-E Apparatus Sales Engineer or Agent today. Or write for descriptive literature to Sect. 417–5, General Electric Company, Schenectady 5, New York.

Progress Is Our Most Important Product

GENERAL ELECTRIC

COLOR CODED

...and *PROTECTED!*

RIGID STEEL CONDUIT by STEELDUCT

ELIMINATES THREAD DAMAGE

SPEEDS WIREMAN'S WORK

Designed to resist rough shipping and storage conditions, these protectors extend over the lip of the conduit as well as the clean, sharp threads for which Steelduct Conduit is noted. NOW wiremen can work faster with Steelduct hot dipped galvanized rigid conduit. Ask your Electrical Distributor for Steelduct Conduit. It will cut your labor costs.

COLOR CODED

For easy size identification, Steelduct Rigid Steel Conduit is Color Coded . . . **black** thread protectors designate ½", 1½", 2½" and 3½" sizes . . . red for ¾" and 1¼" . . . blue for 1", 2", 3", 4", 5" and 6".

THE STEELDUCT COMPANY

REPUBLIC STEEL BUILDING YOUNGSTOWN, OHIO

HOW MANY OF THESE CABLES CAN YOU NAME?

These six are only a few of the many types in the Triangle line of Power, Lighting and Control Cables. How many can you name without peeking at the bottom of the page?

You've probably worked with or specified every one of these types many times – more and more contractors and engineers are doing that these days. They've worked with Triangle Conduit and Building Wire products for years. And they've now become convinced that Triangle can turn out power cables to the same high quality standards. They know Triangle products "must be right"—they must be dependable long-time performers.

Why don't you find out more about these and other cables in the broad Triangle line. Write for complete literature which is available to answer your specific inquiry.

Buy Right—Buy From Your Distributor

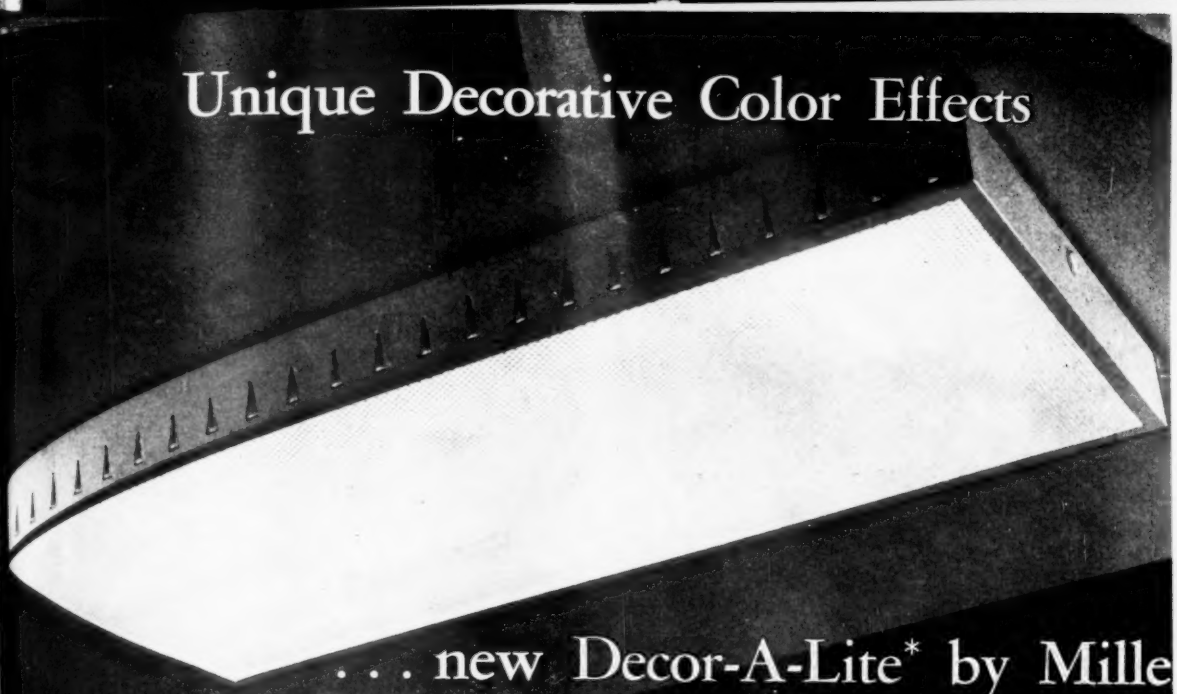
TRIANGLE CONDUIT & CABLE CO., INC.

NEW BRUNSWICK, NEW JERSEY

"It MUST Be Right!"

1 Control Cable 2 Varnished Cambric Lead Covered Power Cable 3 Interlocked Armor Power Cable 4 RR Cable 5 Asbestos Varnished Cambric Power Cable 6 UF Cable

Unique Decorative Color Effects



. . . new Decor-A-Lite* by Mille

Here's a fluorescent fixture th
gives lighting an exciting new ro
in interior design — yet *holds-th*
ceiling on installation and maint
nance costs! Decor-A-Lite is a mod
lar, surface type fixture with sli
contemporary lines. Easily installe
singly or in multiple patterns —
brings a customized, recessed effe
to *on-the-ceiling* lighting for Store
Offices, Schools, and Public Building

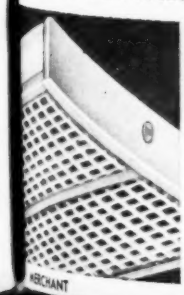
Unique, new decorative effec
are easily attainable with Deco
A-Lite. Side panel lancings em
White or colored light (a choice
Peach, Green, or Gold) which ca
be changed as desired. And y
the color of the room lighting r
mains undistorted.

Decor-A-Lite comes in 1′ x 4′,
x 2′, and 2′ x 4′ sizes. A choice
four bottom closures allows broa
flexibility of lighting design an
application.

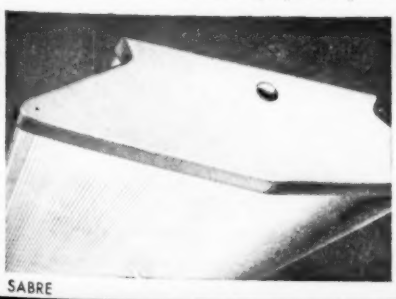
Discover today how Decor-A-Li
can meet your specific lighting d
sign and installation needs. Wri
Dept. 359, The Miller Company
Meriden, Conn. for full catalog i
formation.

*Trademark

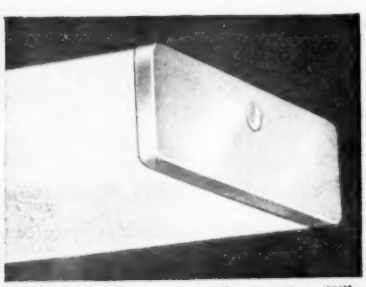
Decor-A-Lite is the newest addition to this popular priced line of fluorescent fixtures for Commercial use.



MERCHANT



SABRE

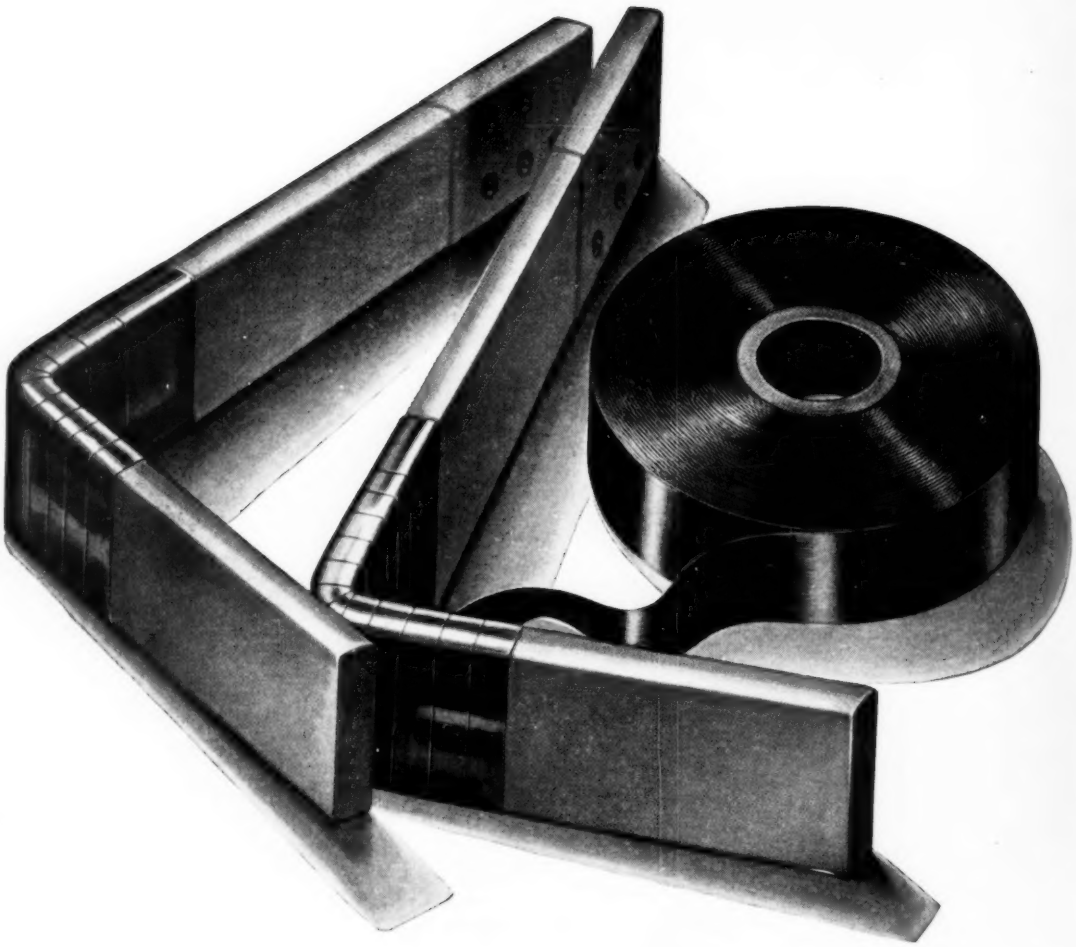


SUBURBAN

LIGHTING BY
miller
SINCE 1844

eye-li

Contact Your Miller Distributor for a



whatever the job . . .

PERMACEL®

PERMACEL *New Brunswick, N. J.* TAPES • ELECTRICAL INSULATING MATERIALS • ADHESIVES

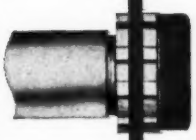
INSULATED CONNECTORS

THE NEW CONCEPT IN FITTINGS THAT REDUCES WIRE PULLING EFFORT UP TO 50%

Insulating Bushing

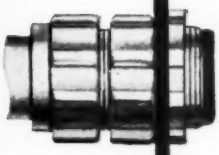
Insulated Metallic Bushing

Insulated Chase Nipple



STANDARD RIGID CONDUIT

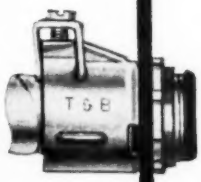
Insulated EMT Connector



ELECTRICAL METALLIC TUBING

Insulated Tite-Bite Connector – straight

Insulated Tite-Bite Connector – 90°



FLEXIBLE CONDUIT OR ARMORED CABLE

Look for the bright blue insulation

ANOTHER NEW T&B ENGINEERED EXCLUSIVE –

The First Line of Self-Insulated Raceway Fittings! Just look at the many benefits you get with these new insulated fittings.

They are the *EASIEST* to Install

Factory-assembled, the Insuliner is a permanent part of the fitting – it can never come loose or pull out. The slippery insulated throat cuts pulling effort by as much as 50%.

They make the *SAFEST* Installation

Because of the nationwide accent on safety, the trend is toward insulated fittings in all locations. Insulated bushings are standard fittings today. Extremely tough they are unaffected by common acids, solvents, moisture or fumes.

They make the *MOST ECONOMICAL* Installation

A one-piece fitting makes installation fast and easy for maximum on-the-job savings. There is no need to add a separate insulating bushing.

They give the Installation a *QUALITY LOOK*

Strong, longer bodies and heavy lock nuts . . . 100% visibility . . . accurate threading . . . all of the features you've come to expect in a T&B engineered fitting.

Write for free samples and technical data or contact your nearby T&B Distributor.

LOOK FOR THIS SIGN –

AUTHORIZED DISTRIBUTOR T&B ENGINEERED

All T&B insulated fittings are listed by Underwriters Laboratories.

IT'S THE MARK OF AN AUTHORIZED T&B DISTRIBUTOR

The complete line of T & B fittings for conductors and raceways is sold only by recognized electrical wholesalers. It's our way of assuring you the service and savings of a friendly local source. Call him for all your electrical needs. T58

THE THOMAS & BETTS CO.

INCORPORATED

34 Butler Street • Elizabeth 1, New Jersey

Thomas & Betts Ltd., Montreal, P.Q., Canada

MANUFACTURERS OF QUALITY ELECTRICAL FITTINGS SINCE 1898

A-B Reliable Control Units

for every industrial application

Among the many hundreds of Allen-Bradley push button and control units, you are certain to find the types best suited to your particular needs. The seven units shown below are a few of the latest additions to the Allen-Bradley *quality* line of control units.

All Allen-Bradley control units—standard duty, heavy duty, and oiltight—have double break, silver alloy contacts—to assure reliable operation. Simple constructions and generous wiring room are outstanding features. Insist on Allen-Bradley control units for *all* of your equipment—you can't go wrong!

NEW

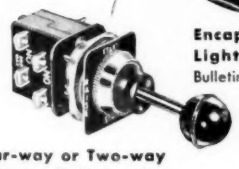
Illuminated Push Button. Combines pilot light and push button in one unit. Oiltight Bulletin 800T.

Encapsulated Pilot Light. Oiltight Bulletin 800T.

Encapsulated Pilot Light. Heavy Duty Bulletin 800.

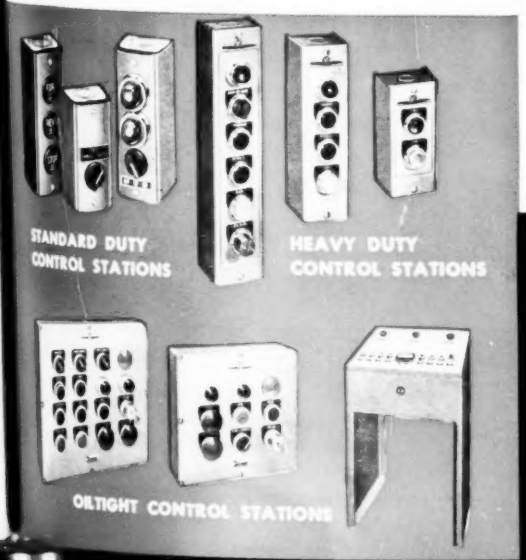
Time Delay Push Button. Delay is adjustable from 0.5 second to 5 seconds. Oiltight Bulletin 800T.

Push-to-Test Pilot Light. Oiltight Bulletin 800T.



Four-way or Two-way Selector Switch. Oiltight Bulletin 800T.

Double Circuit Push Button. Has 2 N.O. or 2 N.C. contacts. Oiltight Bulletin 800T.



ALLEN-BRADLEY OFFERS the most complete line of standard duty, heavy duty, and oiltight control stations on the market. Send for Publication 6090 today.

4-59-MR

ALLEN-BRADLEY

MOTOR CONTROL

QUALITY

Allen-Bradley Co., 1316 S. Second St., Milwaukee 4, Wis.
In Canada: Allen-Bradley Canada Ltd., Galt, Ont.

Positive Protection Against Phase Failure and Phase Reversal ?

Here is your answer!

The Allen-Bradley Bulletin 812 Type F, Type R, and Type RF relays provide positive protection against the hazards to men, motors, and driven machinery, resulting from phase failure and/or phase reversals.

The Bulletin 812 Style F phase failure relay employs a unique static sensing network that responds to all open phase conditions on a motor branch circuit and immediately removes the motor from the line . . . irrespective of the load on the motor (including no load), or the circuit arrangement. This relay even responds to hard-to-detect primary failures on a wye-delta transformer with ungrounded neutral. Furthermore, the five-cycle response prevents nuisance "drop-outs" from transient fluctuations.

The Bulletin 812 Style R phase reversal relay disconnects the motor from the line—whether it is running or not—when a phase reversal occurs anywhere in the system on the line side of the relay. Thus, it can be employed for a single motor, a group of motors, or an entire power system. In addition, the phase reversal relay prevents the motor from starting should phase failure occur while at a standstill—a vital feature for elevator applications.

The Bulletin 812 Style RF relay combines the elements of Style R and Style F relays for protection against both phase failure and phase reversal. All Bulletin 812 relays are inherently "fail safe." Send for complete information.

Allen-Bradley Co., 1316 S. Second St.
Milwaukee 4, Wis.
In Canada: Allen-Bradley Canada Ltd.
Galt, Ont.

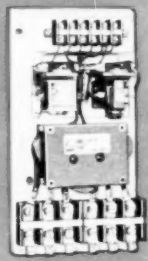
ALLEN-BRADLEY

MOTOR CONTROL

Bulletin 812, Style R
for Phase Failure
and Phase Reversal

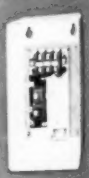
INDIVIDUAL RELAY UNITS AVAILABLE

For Phase Failure



Style F covers full load currents from 1.5 to 300 amp in 4 sizes. Coils for up to 600 v, 60 cycles.

For Phase Reversal



Style R made with coils for 110, 208/220, 440/550 v for either 50 or 60 cycle operation.

With RACO grounding screws you get six big features

When you use RACO switch or outlet boxes, you get six grounding advantages not available with *any other* grounding technique.

With RACO's grounding screws . . .

1—you can use ANY gauge ground wire
2—there is no danger of shorting on any type device
3—you can be sure of a positive ground even when ganging boxes
4—you get ideal ground for either old or new-work installations
5—there is no chance of wall plaster covering ground point
6—box covers or wall plates fit tightly in place

And . . . all RACO cable boxes have grounding holes. Be sure to specify RACO switch and outlet boxes.

RACO

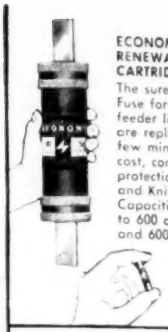
ALL-STEEL EQUIPMENT INC.
Aurora, Illinois

CUT COSTS 3 WAYS!

1. **Cut Replacement Costs — Prevent unnecessary blows!**
2. **Eliminate Costly Work-stoppages — keep production on the move!**
3. **Stop Costly Burnouts — end hazards of dangerous currents.**

ECON® DUAL ELEMENT CARTRIDGE FUSE with the exclusive SUPER SAFETY ZONE

Econ-Alloy (The heart of the Super Safety Zone) permits safe starting loads of up to 500%. Fusible Links protect on short circuits. Perfect for motor circuits with high starting torques. Knife blade or Ferrule types from 0 to 600 amps., 250, 600 volts.



ECONOMY DELAY® RENEWABLE CARTRIDGE FUSES
The surest protection. Fuse for branch and feeder lines — Links are replaced in a few minutes for low cost, continuous protection. Ferrule and Knife Blade types. Capacities from 0 to 600 amperes, 250 and 600 volts.

ECON® ONE-TIME CARTRIDGE FUSES
Positive protection with uniform current-time operation. Ferrule and Knife Blade types. Capacities from 0 to 600 amperes, 250 and 600 volts.

ARKLESS® MECHANICAL INDICATING FUSES
Guaranteed 100% to indicate — Saves locating time — protects every time. Ferrule and Knife Blade types. Capacities from 0 to 600 amperes, 250 and 600 volts.

ECONOMY RENEWABLE PLUG FUSES
For low-cost replacement where repeat blows occur. Fusible Links can be replaced in seconds — Work like new each time. Available in standard and sub-standard sizes, 1 to 30 amps, capacities for 125 volts.

IMPROVE PROTECTION

NEARLY 400 TYPES, SIZES AND CAPACITIES MEAN YOU GET THE RIGHT FUSE TO IMPROVE PROTECTION AND CUT FUSE COSTS 3 WAYS!

It takes a *complete line* to get maximum protection — at reduced cost. Economy's 48 years of leadership in design, engineering and manufacture of a complete line of cost-cutting, circuit-protecting Fuses is your Guarantee of dependable protection for all your electrical systems . . . Next time you buy, specify Economy Fuses to be sure of *complete protection*. They're all shown here in this Economy Fuse Folder #3. Write for your copy today . . . . .

CLEARSITE® PLUG FUSES
Transparent window shows why Fuse has blown. Standard Edison base for 125 volts. Available in both standard and sub-standard sizes, capacities from 1 to 30 amps.

SPECIFY ECONOMY

Economy Trade Name Fuses carry full Underwriters' Laboratories approval and listing.

ECONOMY FUSES FOR EVERY PURPOSE

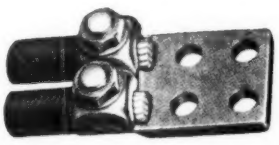
ASK YOUR ELECTRICAL WHOLESALER FOR ECONOMY FUSES . . . THE COMPLETE FUSE LINE!

2717 Greenview Ave., Chicago 14, Ill.

YOU'LL FIND THE SAME ECONOMY FUSE DEPENDABILITY IN:

- ECONOMY FUSTATS from 1 to 30 amperes.
- ECONOMY FUSE PULLERS withstand breakdown test of 35,000 volts dry.
- ECONOMY CLIP TITE fuse clip insures tight contacts.

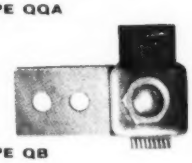
how's your QA-IQ?



TYPE Q2A

TYPE QA-90

TYPE QQA



TYPE Q8

TYPE Q3A

Did you know all of these terminals incorporate all standard Qiklug features?

Popular sizes in stock to meet your individual requirements.

QIKLUG
TYPE QA-B

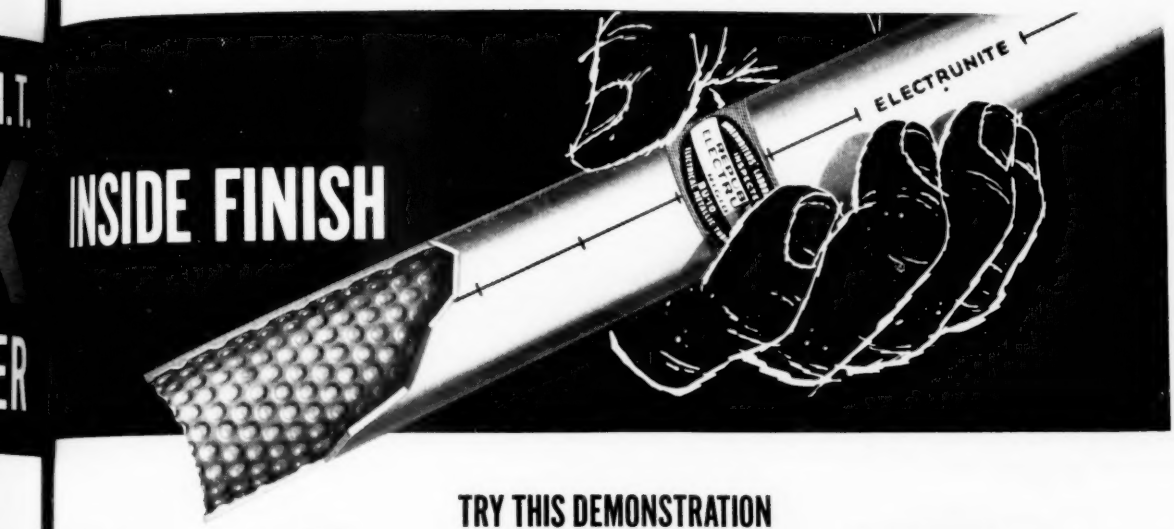
Available for wire sizes #14 thru 2000Mcm.

Get the right answers to all your connector problems.
Write for Burndy Pocket Catalog P-52, filled with facts you'll want in your pocket.

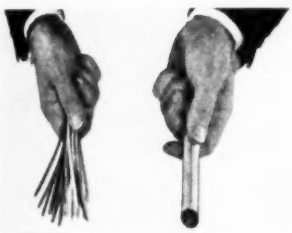
BURNDY

56-1

Norwalk, Connect. • Toronto, Canada



TRY THIS DEMONSTRATION



Take a sample length of Republic ELECTRUNITE E.M.T. with new SILVERSLICK inside finish. Insert a bundle of 25 pipe cleaners. Now, push-pull the pipe cleaners through the tubing.

Depending on the type of wire coating as many as three Number 12's can easily be pushed through a 20-foot run of ½" Republic ELECTRUNITE E.M.T. with four right-angle bends. Ask your electrical distributor sales representative to show you samples with this new inside finish.

PLUS . . . MORE INSTALLATION FEATURES

UNIFORM DUCTILITY in every foot of Republic ELECTRUNITE E.M.T. assures smooth, accurate bends every time—with no costly kinks.

GALVANIZING protects every inch of Republic ELECTRUNITE E.M.T. The electro-galvanized finish will not chip or flake when tube is bent.

UNIFORM CONCENTRICITY assures a truly round tube for snug-fitting connections with no muss, no fuss. Reasons why the *best* costs *less* installed!

REPUBLIC STEEL

World's Widest Range of Standard Steels and Steel Products

REPUBLIC STEEL CORPORATION
STEEL AND TUBES DIVISION
DEPT. C-6889
212 EAST 131st STREET • CLEVELAND 8, OHIO

Please send additional information on the following:

☐ Republic ELECTRUNITE E.M.T. with SILVERSLICK Finish
☐ Republic Bending System

Name_____ Title_____

Company_____

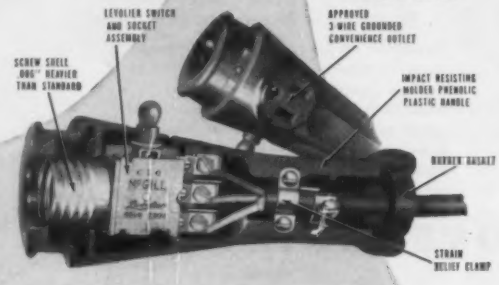
Address_____

City_____ Zone____ State_____

McGILL® PORTABLE LAMP GUARDS are always a little better ...and all are UL inspected

- Rugged, steel wire cage. Spot-welded with extra heavy zinc plated, chromate finish.
- Tough, gray molded phenolic handle resists impact, heat oils, greases, some acids, moisture and abrasion.
- Concentrating end lens. • Convenience hook.
- Approved 3-wire grounded convenience outlet.
- Exclusive McGill LEVOLIER Switch. • Rotary reflector.

No. 5000 SLRG



An extra margin of quality is designed and built into the complete line of McGILL industrial portable lamp guards for safe, dependable utility. Rugged, heavy duty construction and selected materials withstand the punishment of rough use. The famous McGILL LEVOLIER switch mechanism provides a degree of dependability not found in ordinary portables. It's economical to specify the best.

More than 100 different types of McGILL portable lamp guards have been developed to meet the particular requirements of a wide range of service conditions. Cages 50 to 200 watt. 660 watt, 250 volt sockets.

For detailed descriptions of the McGILL line of top quality electrial specialties, including portable lamp guards, and Levolier switches write for McGILL ELECTRICAL SPECIALTIES CATALOG No. 84.

No. 7100 SR Lamp Guard

Thumb clamp arrangement for cage to change lamps quickly without tools. Gray Neoprene-butyl handle; reflector; LEVOLIER switch.

No. 5025 SRG Service Light

Completely grounded service light. 15 amp., 125 volt convenience outlet built into molded phenolic handle. Safe on-the job source for power tools. Levolier switch and 25 ft. 16-3-SJ gray rubber cord.

No. 5000 SR Lamp Guard

With 15 amp., 125 volt convenience outlet in impact and heat and grease-resisting positively insulating molded phenolic handle. No-Rol cage, Levolier switch and reflector.

No. 3006 Vaporproof Lamp Guard

Watertight, vaporproof and moistureproof for complete safety. Heat and impact resisting glass globe screws into a silicone rubber gasket. Handle molded of macerated phenolic.

No. 652 Lamp Guard

Rubber hook handle, thumb release clamp for easy bulb replacement. Can be hung, for maximum light, from hook or handle.

Write for Free McGill Catalog No. 84

engineered electrical products

McGILL®

precision needle roller bearings

McGILL MANUFACTURING COMPANY, INC., ELECTRICAL DIV., 450 N. CAMPBELL ST., VALPARAISO, INDIANA

Architect: GRAHAM, ANDERSON, PROBST & WHITE, Chicago, Illinois
Electrical Contractor: HYRE ELECTRIC CO., Chicago, Illinois

Electrical Protection goes MODERN *with BUSS fuses! . . . in the MORTON SALT BUILDING Chicago, Ill.*

The beautiful, new Morton Salt Building is located at 110 North Wacker Drive in Chicago — just outside the Loop.

The safest and most dependable electrical protection was needed because the engineers estimated the available fault current might easily reach a value of 75,000 amperes.

For this reason, the main switchgear, consisting of 1-4000 ampere, 1-2000 ampere and 1-1200 ampere pressure switch, is completely equipped with BUSS Hi-Cap fuses.

To make available the same safe, dependable and trouble-free protection, all distribution panels are equipped with FUSETRON dual-element fuses.

THERE IS A BUSS OR FUSETRON FUSE FOR EVERY ELECTRICAL NEED

ONLY FUSES OFFER THE SAFETY AND DEPENDABILITY REQUIRED FOR TODAY'S CIRCUITS

Because of the ever-increasing transformer and network capacities, Power Companies now consider quite possible fault currents of 75,000 to 200,000 ampere.

So too, the requirements for protective devices have been changed to assure safe interruption of these higher fault currents.

Fuses, — because of their high interrupting capacity and dependability — prove superior in meeting modern protection requirements.

With Fuses, Safe Protection Remains Safe

Dust, fumes, corrosion or age cannot increase a fuse's capacity or lengthen its blowing time. The operation of a fuse is not dependent on latches, triggers or other devices that are subject to the strains and jars of mechanical action — both in opening and closing.

A fuse cannot stick or fail to operate when electrical trouble occurs. 1 year, 5 years or 20 years from now, a fuse will provide the same, high degree of protection as on the day it was installed.

Morton Salt Building: Mains and Feeders protected by BUSS Hi-Cap and FUSETRON Fuses

On installations of 0 to 600 amperes . . .

By Installing FUSETRON dual-element FUSES — YOU GET 10 POINT PROTECTION

With rare exceptions, other types of protective devices protect only against short-circuits —

BUT, FUSETRON dual-element fuses give you safe, trouble-free 10 point protection.

For the FUSETRON fuse story ask for Bulletin FIS.

For Loads above 600 amperes . . .

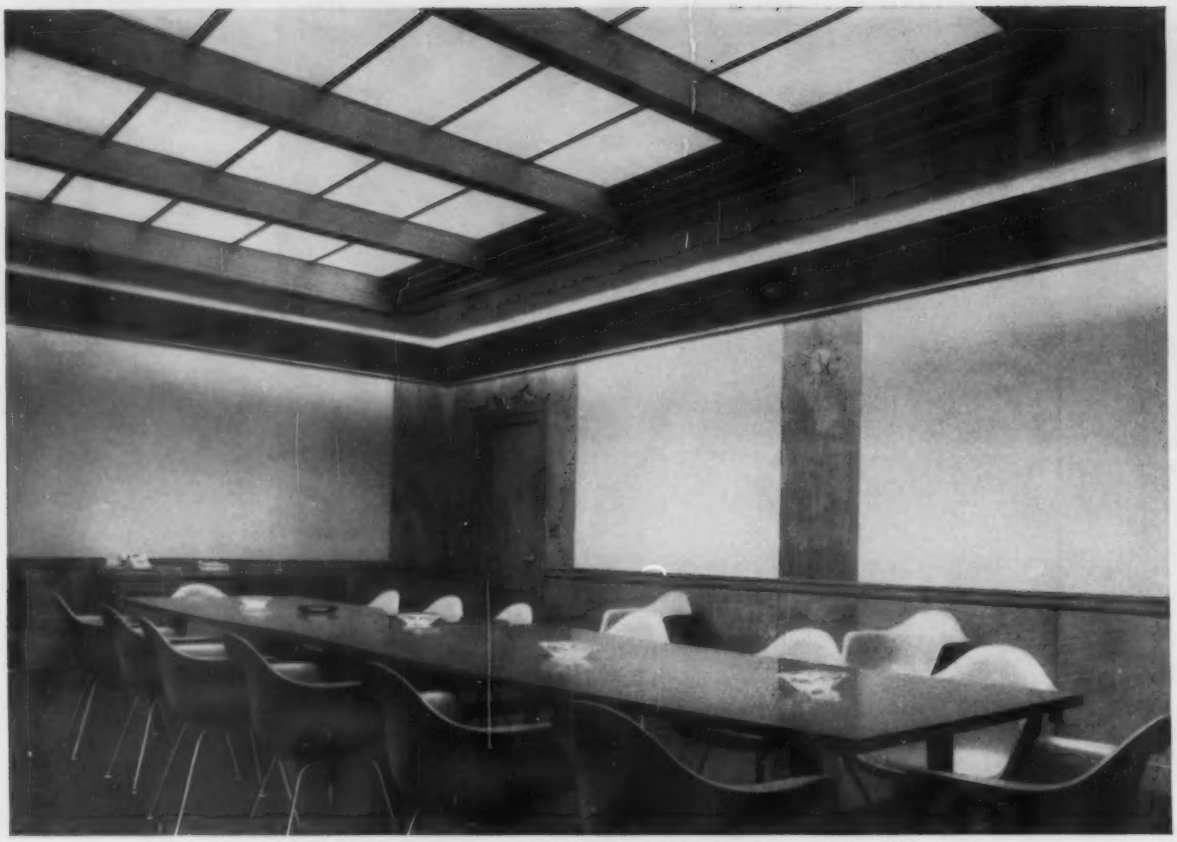
BUSS Hi-Cap Fuses offer Safest, Most Modern Protection

They have an interrupting capacity sufficient to handle any fault current regardless of system growth — and by coordinating them with FUSETRON fuses on feeder and branch circuits, outages caused by fault currents can be limited to circuit of origin.

For the BUSS Hi-Cap fuse story ask for Bulletin HCS.

359

BUSSMANN MFG. DIV. McGRAW-EDISON CO. ST. LOUIS 7, MO.



Walworth . . . Another Money's Worth Lighting Installation Featuring High Intensity Plus Visual Comfort — by LITECONTROL

This completely new office building of the Walworth Company, leading valve manufacturer, uses Litecontrol fixtures throughout, except for a few small areas.

The Conference Room, a handsome interior, received special treatment. Litecontrol strip fixtures were specified behind a mahogany valance around the four sides. They illuminate the walls and part of the ceiling. The center bay of our lens fixtures illuminates the conference table. All of these latter fixtures may be operated together, or half of them, as desired.

The same fixtures used in the office were also utilized, spread out, in the Cafeteria and in the washrooms which indicates the versatility of the equipment. The employees who have to live with the lighting speak very highly of it — *especially of its comfort*. After working all day, there are no late afternoon headaches. The lighting intensity is evident but glare is absent.

Litecontrol is a good name to remember when commercial lighting is under discussion. *It does the job. It cuts your costs.*

INSTALLATION:
Walworth Company, South Braintree, Mass.

AREA SHOWN:
Conference Room

ENGINEERS:
Charles T. Main, Inc., Boston, Massachusetts

ELECTRICAL CONTRACTOR:
Hixon Electric Company, South Boston, Mass.

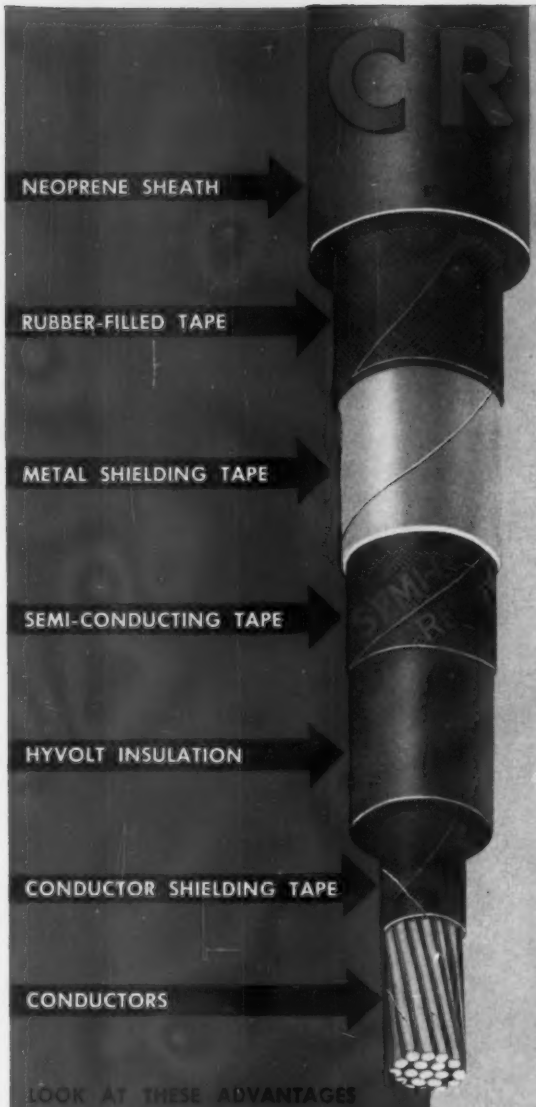
GENERAL CONTRACTOR:
George A. Fuller, Co., Boston, Massachusetts

GENERAL OFFICES:
Ceiling Height 9′ — 0″
Fixture spacing, 7′ — 0″ on centers
Fixtures, Litecontrol #6828SL-70 two lamp slimline, with Corning Pattern 70 lens panels, grid ceiling fixtures.
Average intensity, 85 footcandles in service.

CONFERENCE ROOM:
Ceiling Height 9′ — 2″
Fixtures, Over table, Litecontrol #8424RS, two lamp rapid start, with Holophane #6025 acrylic CONTROLENS* #N-15SC-48DRS rapid start strip fixtures behind valance.
Average intensity, on table, 200 footcandles in service.
*Reg. Holophane Co., Inc.

LITECONTROL
Fixtures
KEEP UPKEEP DOWN
LITECONTROL CORPORATION,
36 Pleasant Street, Watertown 72, Massachusetts

DESIGNERS, ENGINEERS AND MANUFACTURERS OF FLUORESCENT LIGHTING EQUIPMENT DISTRIBUTED ONLY THROUGH ACCREDITED WHOLESALERS



CRESCENT

HYVOLT SHIELDED POWER CABLE

Gives More Amperes Per Dollar of Installed Cost

CRESCENT HYVOLT insulation is made from butyl rubber which is inherently resistant to ozone, heat, moisture and aging. HYVOLT is formulated and processed so as to retain these inherent characteristics of the butyl rubber and at the same time provide excellent electrical and physical properties.

The insulation is protected during and after installation by an outer neoprene sheath providing a maximum degree of toughness, durability and long life. It is flame retarding and resistant to the deteriorating effects of moisture, sunlight, ozone (corona), oil, grease, and many acids and alkalies.

HYVOLT Shielding provides additional internal and external protection in these THREE WAYS

1 Conductor shielding, as provided by a semi-conducting tape over the stranded conductors, excludes air pockets between conductor and insulation and eliminates possible internal corona-cutting of the insulation.

2 The semi-conducting tape between the insulation and metallic shielding tape prevents possible ionization of air spaces and corona at the insulation surface.

3 The metallic shielding tape is grounded when installed, resulting in zero potential to ground at the sheath. It prevents surface discharge or burning, and protects cable from lightning surges. Reduces shock hazard.

RECOMMENDATIONS

CRESCENT SHIELDED HYVOLT CABLE is recommended for use in conduits, underground ducts, in wet or dry locations, or buried directly in the ground, for circuits operated at over 3000 volts and in accordance with I.P.C.E.A. recommendations. Available in single conductor or multi-conductor cables.

Specify CRESCENT SHIELDED HYVOLT POWER CABLE for general power circuits and where severe conditions are prevalent such as chemical plants, refineries, paper mills, mines, sewage disposal plants, etc. It is approved as Airport Lighting Cable Type B, CAA Specification L-824.

LOOK AT THESE ADVANTAGES

1. Long life.
2. Can be operated at 85°C. Permits smaller conductors or more amperes per conductor.
3. Freedom from corona cutting.
4. Excellent resistance to moisture.
5. Low power factor and dielectric loss.
6. Lighter, more flexible, easier to handle and install than lead covered cables.
7. Electrolytic or chemical corrosion of lead sheath is eliminated by use of neoprene sheath.
8. Shielding prevents possibility of surface burning and provides safety to human life.

CRESCENT INSULATED WIRE & CABLE CO., INC.
TRENTON, NEW JERSEY

Neoprene jacket on Anaconda cable takes impact of avalanche

This 5000-volt cable had already provided 5 years of service when a strip mine mishap buried it under tons of rock. The cable was supplying power to a giant ore stripping shovel when an overhanging section of a 90-foot cliff suddenly collapsed.

The rockslide stretched, gouged and pounded a 500-foot section of the neoprene-jacketed cable . . . but didn't knock it out. The buried cable continued to maintain service.

To protect the strong internal construction of their cable, Anaconda Wire and Cable Company use jackets of Du Pont neoprene. Installations like this prove that neoprene has the necessary resilience to prevent cutting, gouging and impact damage, and neoprene's excellent weatherability and resistance to chemicals, oil, heat, cold-weather stiffness provide *protection that lasts.*

You can be sure of long-lasting performance when you specify neoprene jacketing on wire and cable. For details, write to E. I. du Pont de Nemours & Co. (Inc.), Elastomer Chemicals Dept. EM-3, Wilmington 98, Delaware.

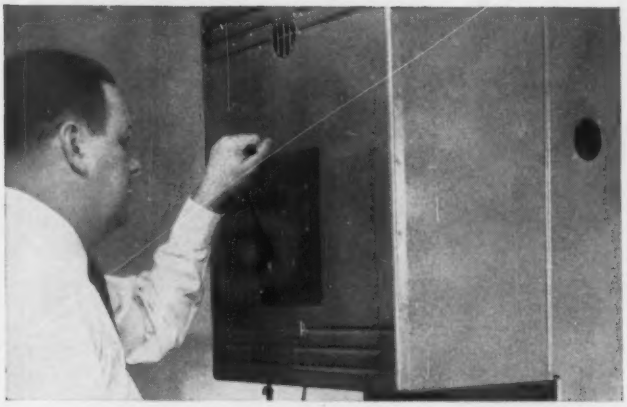
DU PONT
REG. U. S. PAT. OFF.

SYNTHETIC RUBBER

NEOPRENE
HYPALON®
VITON™
ADIPRENE®

BETTER THINGS FOR BETTER LIVING . . . *THROUGH CHEMISTRY*

Metal-clad switchgear you can be proud of. Extra sturdiness for longer life. Extra craftsmanship for finer appearance. Extra safety for greater personnel protection. All components completely accessible. Even rear doors are hinged. Advanced design, uniform-flux-density coils mean extra protection against heavy current faults.



600 volt value package. New URELITE® individually enclosed I-T-E K-line circuit breaker—world's most advanced. Main disconnect contacts visible through side window for extra safety. Pull-down handle action provides quick manual make for safety and long contact life. New wide-range overcurrent trip device lets you increase breaker setting when your load increases. No parts to replace.

Saves 50% switchboard space. I-T-E CORDON® circuit breaker provides up to 100,000 amp interrupting capacity with molded case construction. Costs approximately ⅓ less than alternative devices. Available in sizes for many applications, loose or individually enclosed.

I-T-E Circuit Breaker Company
1900 Hamilton St., Phila. 30, Pa.

- ☐ Low voltage switchgear
- ☐ Metal-clad switchgear (5 and 15 kv)
- ☐ Secondary unit substations
- ☐ Outdoor substation structures
- ☐ TRANFO-UNITS
- ☐ URELITE circuit breakers
- ☐ Small air circuit breakers
- ☐ CORDON circuit breakers
- ☐ Power switching centers

Name.....Title.....

Company.....

Street.....

City.....Zone.....State.....

SEND COUPON

Get full details on specific I-T-E equipment. I-T-E engineering assistance is at your disposal.

GET GOLD SEAL RUBBER TAPE *for easy handling and instant fusing*

Here's the tape for high voltage insulation! Easy to work with, Gold Seal Rubber Tape fuses together instantly, provides long-life insulation protection. With its high dielectric strength and ability to conform to irregular shapes, Gold Seal makes a perfect insulating splice. Jenkins Bros., Rubber Division, 100 Park Avenue, New York 17.

Gold Seal Tape

FOR EVERY APPLICATION

Gold Seal Friction • RUBBER • Plastic Tapes . . .

Commercial and Specification Grades

In 10-roll containers or single rolls. Each roll sealed in cellophane, stays fresh.

The SYLVANIA LIGHT INSURANCE Policy

(GUARANTEED BY SYLVANIA)

A new plan to protect you and your customers' lighting investment: Sylvania fluorescents must give more light at lower cost than any other brand . . . or cost nothing!

Now, Sylvania fluorescent lamps *have got to outperform all other brands* on the basis of uniformity of performance, uniformity of appearance, maintained brightness, and life. They *must* give more light, at lower cost, than any other brand!

Because if they don't, they cost nothing.

Under a unique new policy, every large, regular user of Sylvania fluorescent lamps can have his lighting investment insured by Sylvania—at no cost to himself! If Sylvania's fluorescents do not live up to these claims, Sylvania refunds full purchase price.

How can we afford this kind of protection?

Answer: We know our product. We have studied it, worked with it for years to put it in a clear position of quality leadership. We can't lose.

And what better time to offer this new insurance than 1959—the year in which Sylvania engineers have swept *light-years* ahead of competition in fluorescent lamp efficiencies. For Sylvania fluorescents now give over 75 lumens per watt in the 75-watt, 8-foot lamp size . . . over 70 lumens per watt in the 40-watt, 4-foot size.

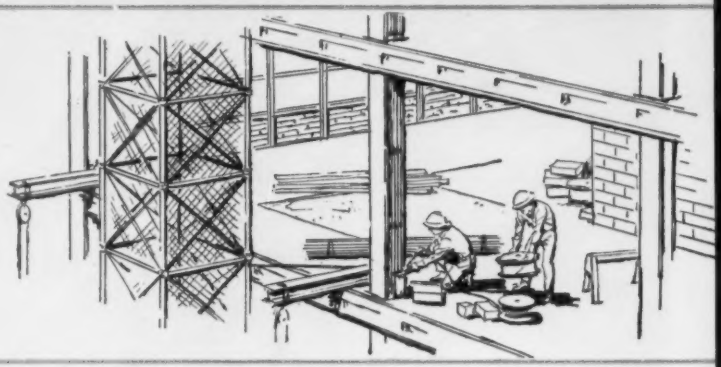
Ask your Sylvania representative or supplier to see a copy of the new Sylvania Light Insurance policy. And insist you get a policy with your next purchase. *If you prefer, write to us direct.*

SYLVANIA LIGHTING PRODUCTS
A Division of SYLVANIA ELECTRIC PRODUCTS INC.
Dept. 9L-8303, 60 Boston Street, Salem, Mass.
In Canada: Sylvania Electric (Canada) Ltd.
P. O. Box 1190, Station "O," Montreal 9

SYLVANIA . . . *fastest growing name in sight*

LIGHTING • TELEVISION • RADIO • ELECTRONICS • PHOTOGRAPHY • ATOMIC ENERGY • CHEMISTRY-METALLURGY

to **YOU**



ONE SURE SOURCE OF SUPPLY

for all your wire and cable needs

This bird's eye view shows why working through a Circle distributor is your best assurance of quality products, ample stocks, and all-out service.

Take *quality!* It's assured because Circle controls every step in the manufacturing process—from the basic metals mined and refined by Circle's *own parent company,* Cerro de Pasco—down to the finished product.

Stocks? Circle's huge plants turn out over *a billion feet of wire and cable yearly*—enough to keep its many centrally-located warehouses fully stocked to meet all your wire and cable needs.

Service? Many contractors already know that Circle distributors get fast action with a simple telephone call—the result of a distributor policy that's out of sympathy with "red tape" and stuffed shirts.

Why don't *you* make a Circle distributor your "one sure source of supply." Many other satisfied customers do.

CIRCLE **WIRE & CABLE**
a subsidiary of
CERRO DE PASCO CORPORATION

PLANTS: Maspeth and Hicksville, N. Y. **SALES OFFICES & WAREHOUSES:** in all principal cities

RUBBER COVERED WIRES & CABLES • VARNISHED CAMBRIC CABLES • PLASTIC INSULATED CABLES
NEOPRENE SHEATHED CABLES • "CIRTUBE" EMT

CONTRACTORS "DISCOVER" ALCOA CONDUIT

Lower cost, installation economies, corrosion resistance make Alcoa Aluminum the best conduit buy

An increasing number of cost-conscious contractors are switching to aluminum rigid conduit for office buildings, industrial plants and other new and remodeled structures. Here are some of the reasons why:

- Lower prices plus light weight and ease in handling make Alcoa® Aluminum Conduit installations competitive.
- Corrosion resistance of aluminum means less maintenance, freedom from staining.
- Aluminum is easier to cut, bend and thread. Wire pulling is easy, too, because of specially treated internal surface.
- Nonmagnetic aluminum offers up to 20 per cent less voltage drop.
- Clean, modern appearance complements modern architecture.
- Aluminum is nonsparking and has Underwriters' Laboratories, Inc., approval.

Find out why Alcoa Aluminum is your best conduit buy. Contact your electrical distributor, or write Aluminum Company of America, 2140-C Alcoa Building, Pittsburgh 19, Pennsylvania.

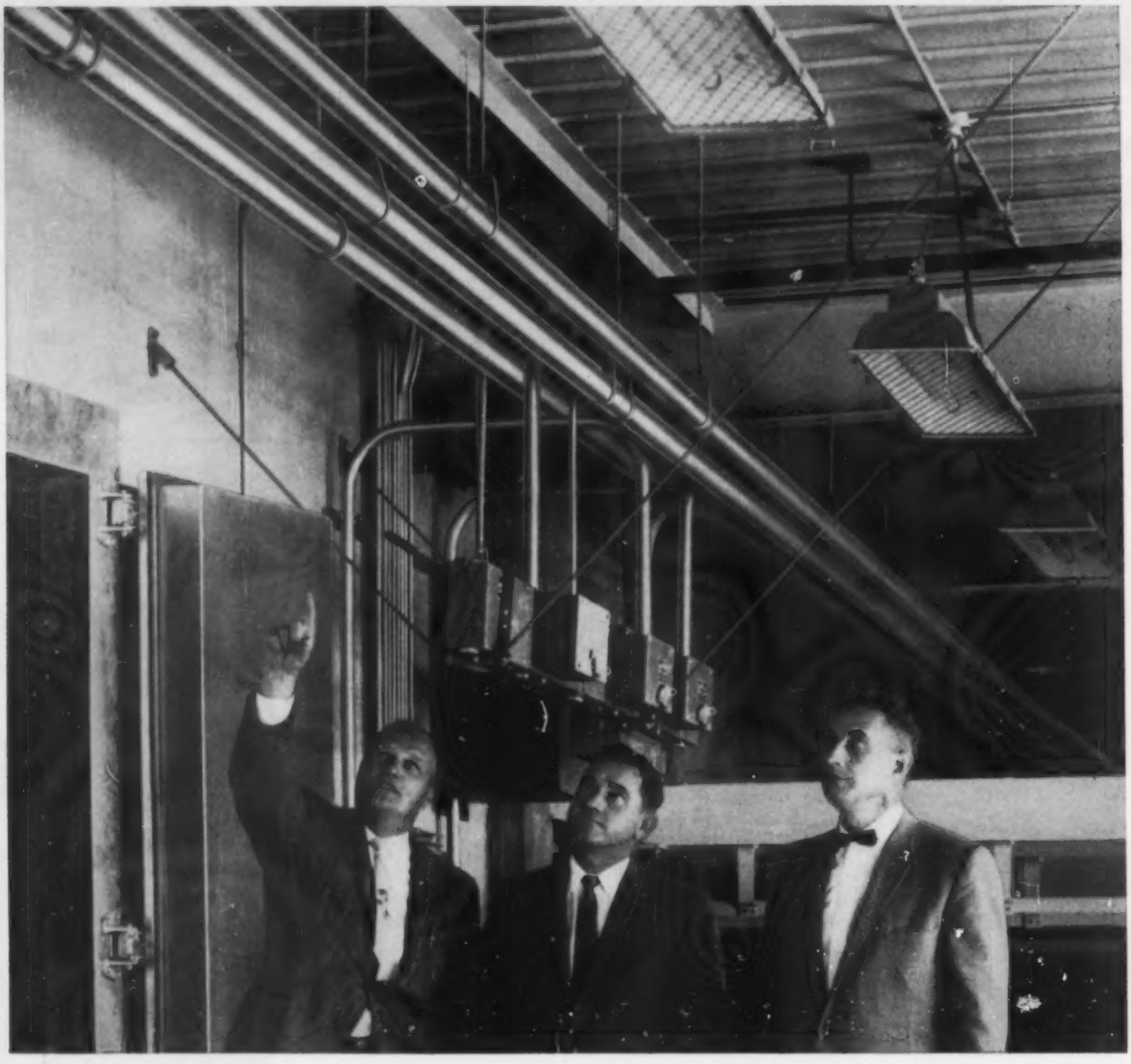
For Exciting Drama Watch "Alcoa Theatre," Alternate Mondays, NBC-TV, and "Alcoa Presents," Every Tuesday, ABC-TV

ALCOA ALUMINUM

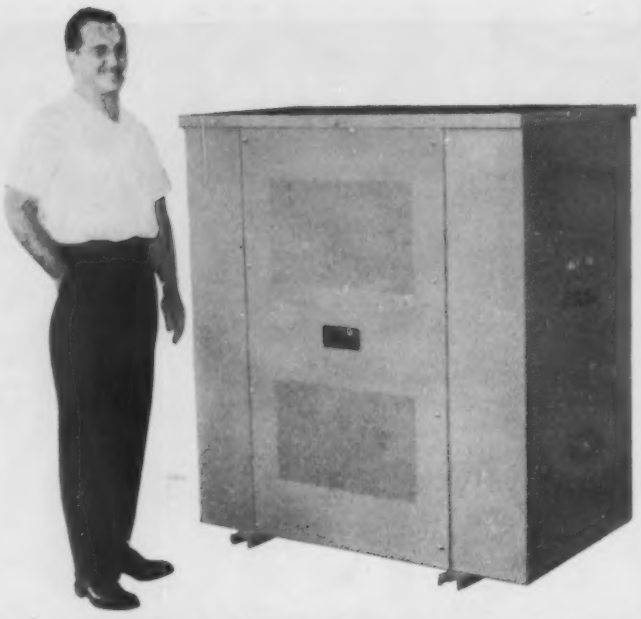
Underwriters' Laboratories, Inc. INSPECTED RIGID CONDUIT ISSUE MU-28

Ask for your Free Copy of New Booklet on Alcoa Aluminum Conduit

Safeway Stores, Portland, Oregon



UPTEGRAFF

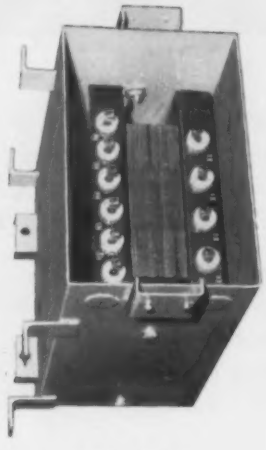


150 kva to 500 kva
(TYPE DX & DXT)

(1) Single and three phase, 4800 volts and less, (2) Class B insulation, ventilated, (3) Floor mounted, cabinet type construction, (4) Large access panels on front and back, removable cover.

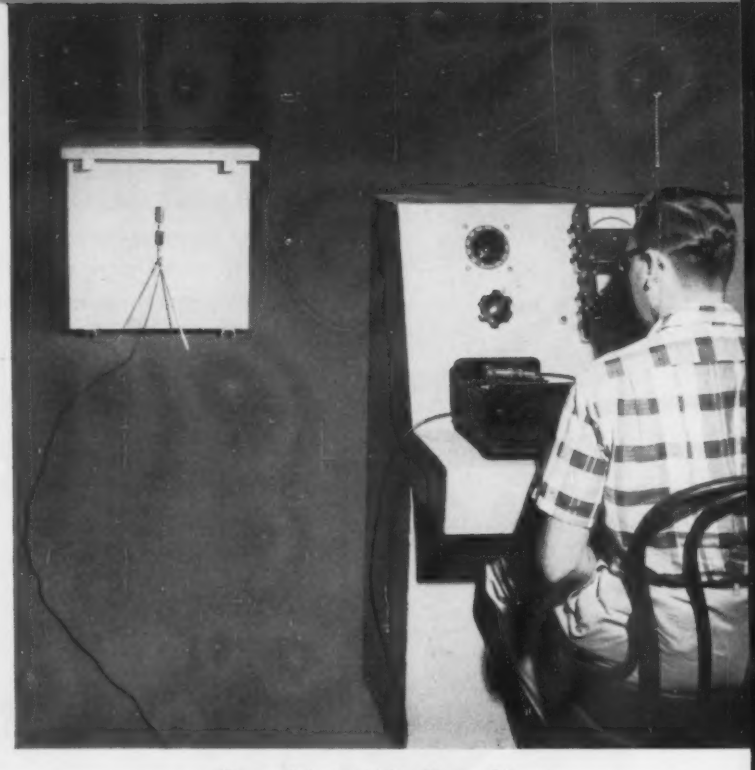
for GREATER OVERLOAD CAPACITY

DRY TYPE DISTRIBUTION TRANSFORMERS



3 kva—112½ kva
(TYPE DB & DBT)

(1) Silicone-impregnated windings, (2) Class B insulation, (3) Ceiling, wall or floor mounting, (4) Metal and porcelain terminal boards, see above, (5) High voltage and low voltage separated on voltages over 600, (6) Low sound level performance.



Sound Level Testing, Above

15 kva—112½ kva (TYPE DH & DHT)—(1) Accessible terminals and taps, in separate junction box, (see below), (2) Totally-enclosed, suitable for outdoor use, (3) Silicone-impregnated windings, (4) Class H insulation, (5) Flexibility as to mounting, (6) Low sound level.

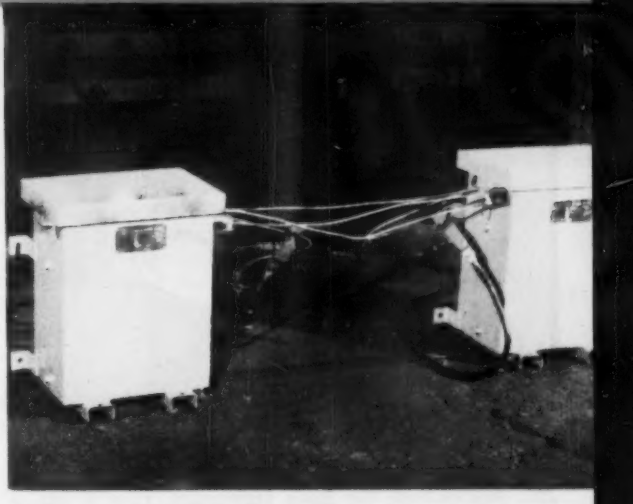
3 kva—10 kva (TYPE H)—(1) Underwriters approved, (2) Compact, wall-mounted, (3) Silicone-impregnated, (4) Class H insulation, (5) Totally-enclosed, dust-tight, (6) Accessible clamp-type terminals as seen below.

. . . and consistently high level performance

IN 4 MODERN MODELS . . . WITH ADVANCED DESIGN FEATURES

Research and product development pay off in transformers with greater overload capacity, longer life and quality performance. The improved quality of Uptegraff's line of dry type distribution transformers is the result of many years of research, persistent search for new and better materials, and engineering of the numerous design improvements listed on these pages.

Silicone-impregnated windings in all Class B types, 112½ kva and smaller, for example, provide greater overload capacity, superior moisture resistance and high temperature characteristics. Acoustical redesigning achieved quieter transformer operation. Among the many "quality control" tests is sound level analysis, seen on the left. Other tests—in addition to ASA, NEMA, and AIEE standards—assure transformers of optimum quality and performance.



Silicone-impregnated windings withstand 42% more overload. Comparative insulation tests in Uptegraff laboratories showed that transformers with silicone-impregnated windings, above right, withstood up to 42% greater overload than ordinary varnish insulation, above left. Varnish failed at 210% of rated load, silicone impregnation withstood 300% of load.

Ask for New Bulletin

Complete product specifications of the four major models, ranging from 3 kva to 500 kva, 4800 volts and less, are given in Bulletin 137-A.

R. E. UPTEGRAFF MANUFACTURING COMPANY

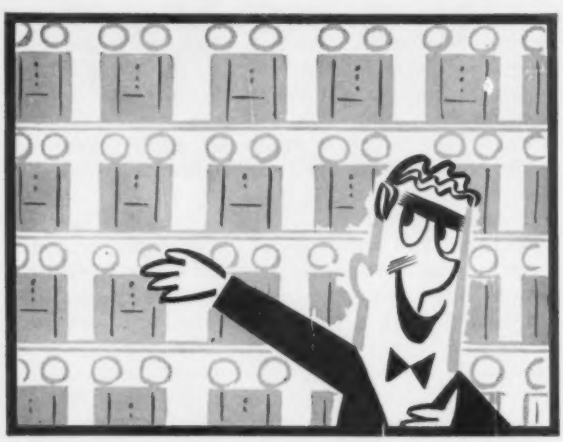
SCOTTDALE, PENNSYLVANIA

HOW TO MAKE A MINT OF MONEY SELLING EXIDE LIGHTGUARD® UNITS

1. Find prospects everywhere. Look for buildings with people in them and where sudden darkness could cause injury, damage or theft. This includes nearly all the commercial, industrial and public buildings in your area.

2. Show the Exide Lightguard. Point out that its superior power capacity means more light-hours in the event of emergency. Genuine Exide battery with built-in charger gives years of trouble-free protection.

3. Demonstrate the Exide Lightguard. Plug it into a light socket, then switch off the power. Show how the Exide Lightguard goes on instantly and automatically. Floods an area with light till power comes back on.



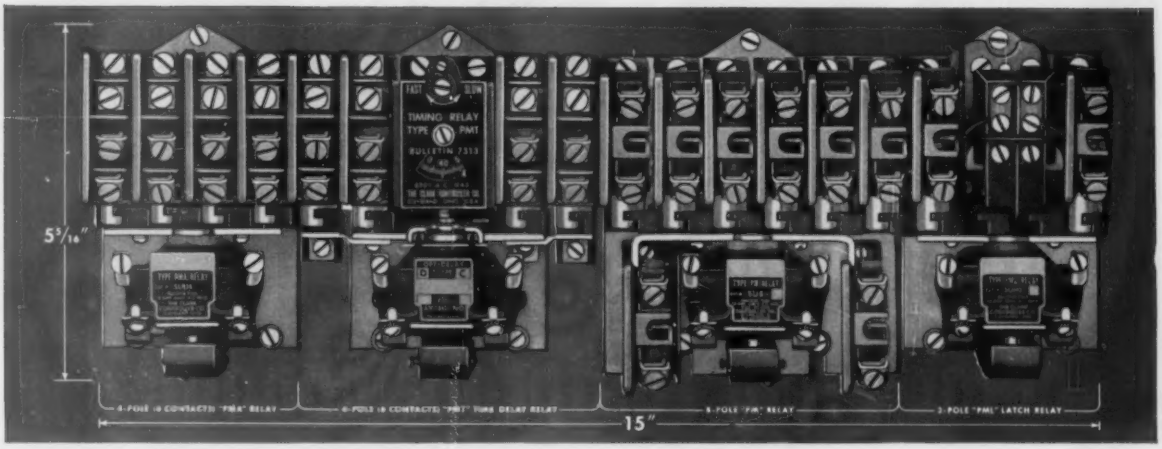
4. Ask how many the customer needs. You'll find most users will buy several—one for each area to be protected. Many orders will run to important money. So selling Exide Lightguard units can be profitable business.

Here's your market:

Every business, factory, office, institution, theater, school, church. If they don't have emergency light now, you can be sure they need it. And they're better off if they buy Exide Lightguard. Why don't you be the one to sell it to them. For information on becoming an Exide Lightguard dealer, write Exide Industrial Division, The Electric Storage Battery Company, Philadelphia 2, Pa.

Exide®

NOW CLARK OFFERS THE MOST COMPLETE INTEGRATED LINE OF CONTROL RELAYS AVAILABLE TODAY!



UNIVERSAL POLE RELAYS

up to 14 contacts per relay

New Clark Universal Pole Relays now double the available number of contacts per relay. Each universal pole contains two isolated contacts—one normally open, one normally closed. Melamine barriers and spacing provide 600-v clearance between contacts. Contacts have 10 ampere rating and wiping action. Universal poles are interchangeable with convertible poles of "PM" relays.

Line up with other Clark relays on a panel!

TIME DELAY RELAYS

2 or 4 timed contacts
—up to 6 instantaneous contacts

New Clark Pneumatic Time-Delay Relays match physically other relays in the "PM" line. Timing head occupies the space of 2 poles above magnet. Universal poles each have isolated normally open and normally closed contacts, with 600-v clearance. Timed and instantaneous poles are identical. Available for "ON-DELAY" or "OFF-DELAY" operation (time delay after energization or de-energization), and easily convertible.

Line up with other Clark relays on a panel!

CONVERTIBLE POLE RELAYS

2 to 12 poles

The original line of space-saving control relays featuring exclusive Clark "modular construction". Revolutionary design provides 10 standard units with 2 to 12 poles, from 5 basic models. Stocking of relays and spare parts is greatly simplified. Poles are easily converted from normally open to normally closed and vice-versa. Individual poles are front removable without disturbing wiring.

Line up with other Clark relays on a panel!

LATCH RELAYS

2 to 10 poles

New Clark mechanically-held, latched-in relays have same modular design as "PM" relays—with latch unit occupying the space of two poles above magnet. No increase in height—saving panel space. Latch unit has its own continuous duty coil, allowing one more pole for circuit use since a relay pole is not needed to cut out coil when energized for sustained periods.

Line up with other Clark relays on a panel!

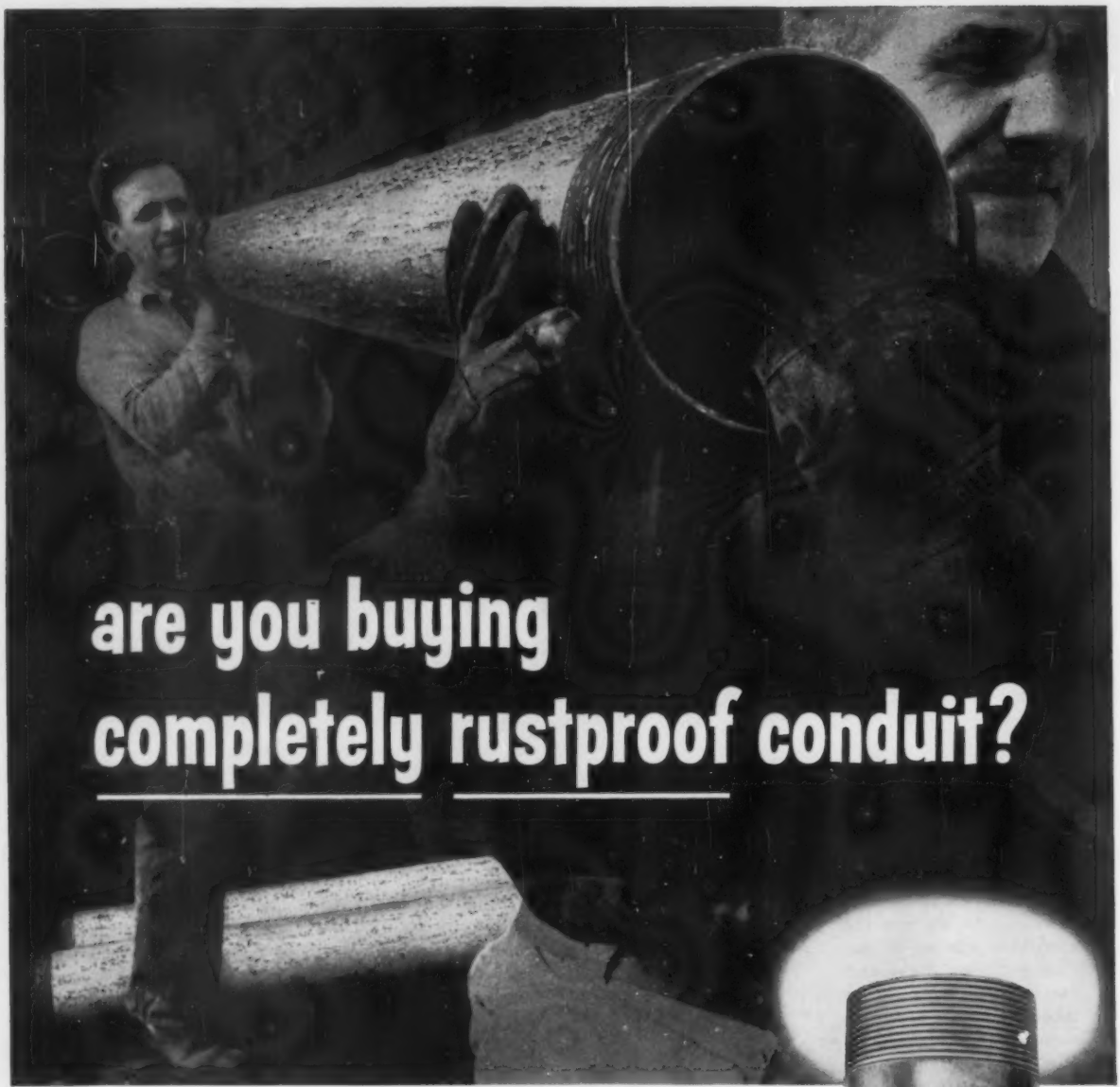
Detailed descriptive bulletins are available for all relays in the Clark "PM" line. Contact your nearest Clark sales office or write us direct.

The CLARK CONTROLLER *Company*

Everything Under Control

1146 East 152nd Street • • Cleveland 10, Ohio

MAIN OFFICES AND PLANT, TORONTO • IN CANADA: CANADIAN CONTROLLERS, LIMITED



are you buying completely rustproof conduit?

PITTSBURGH STANDARD HOT-DIP GALVANIZED CONDUIT IS RUSTPROOF FROM END TO END

The zinc chromate coating that characterizes Pittsburgh Standard Hot-Dip Galvanized Conduit doubles the protective life of the galvanizing. And the hot-dip galvanized and coated threads stay bright, clean and sharp. No chasing or cleaning required even when conduit lies in storage for months. All thread protectors are color-coded for easy size identification.

For ease in handling, Pittsburgh Standard conduit is banded into master lifts, and the individual bundles of each size are identified by color-coded bundling tapes. All these features are yours at no extra cost when you buy Pittsburgh Standard. Ask for them at your electrical distributor's. *Pittsburgh Standard Conduit Company, Verona, Pa.*

PLANTS AT VERONA AND MORRISVILLE, PA.

RIGID STEEL CONDUIT · ELECTRICAL METALLIC TUBING · ELBOWS · COUPLINGS · FITTINGS

58TH YEAR • MARCH 1959

ELECTRICAL CONSTRUCTION AND MAINTENANCE

Electric Heating for Schools

About 200 school buildings in the U. S. already completed or under construction, are heated electrically. Every installation is arousing keen public interest and many of the projects are producing valuable data which will unquestionably influence future school construction. They are, in fact, threatening to obsolete fuel-fired heating for schools.

Electric heating systems going into some of our new schools are superbly modern, completely safe installations, requiring no custodial care and only routine housekeeping attention. And school administrators have discovered something more, of peculiarly significant importance to them. The electric heating system eliminates any need for administrative supervision and attention to heating the building; a vital, vexing and almost constant concern in schools heated by large, central fuel-fired plants.

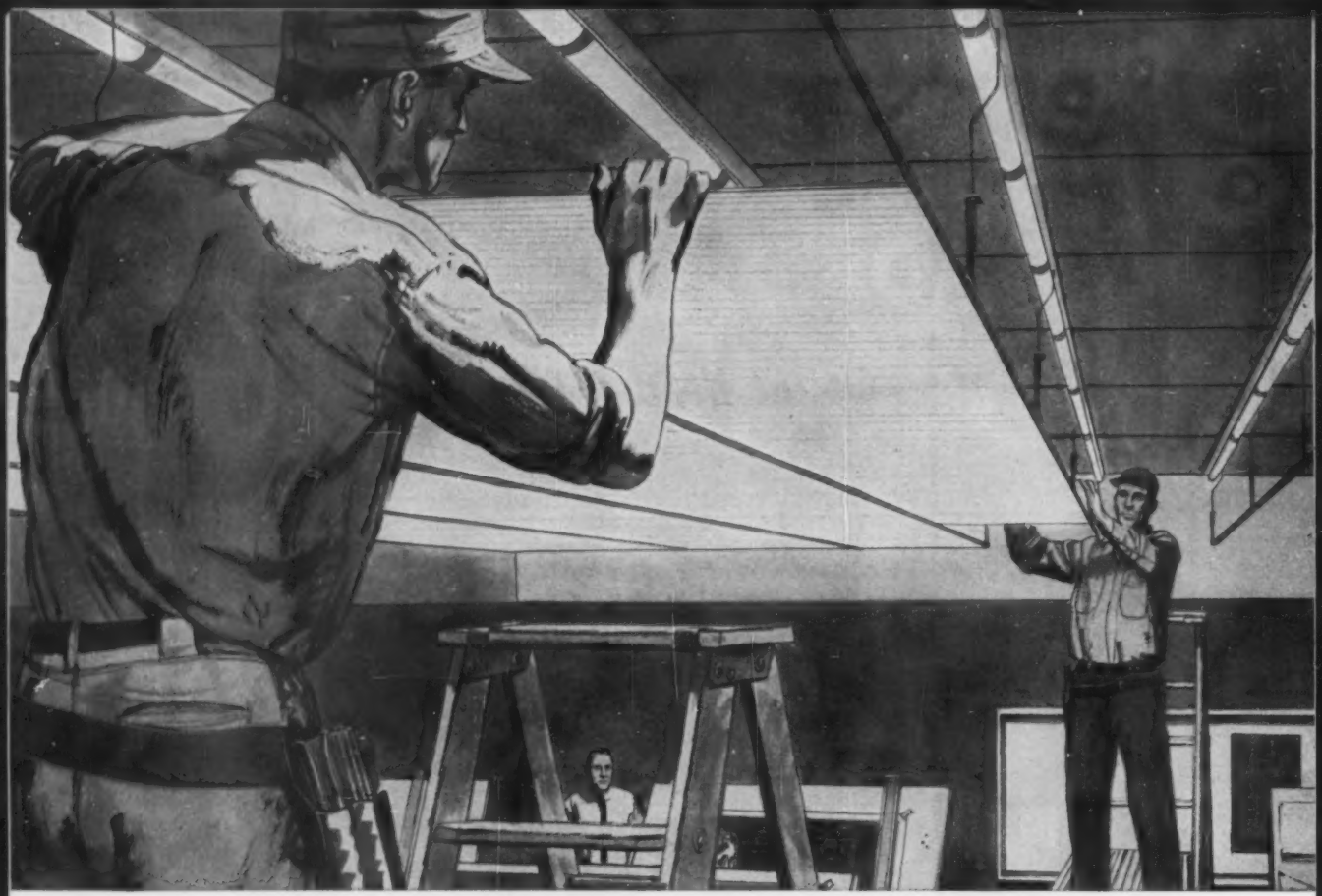
School architects and board members are watching closely another aspect of electric heat. What happens when the architect and engineer can start from scratch, not only designing electric heat into the building, but designing the building around the extraordinary flexibility of electric heat application? There are impressive savings in the heating system and even more in the structure—economies which can be applied to reduce capital cost or to provide more class rooms and useful facilities for the same investment.

Electric heat also frees the architect from the critical physical and mechanical considerations of the conventional wet heat system, a matter of significant importance particularly in the design of low, spreading, loosely-coupled structures. The simple electrical feeders and circuits serving the heating equipment can follow efficiently any feasible route, concealed in slabs or ceilings, exposed or buried underground. Hot water systems, too, are almost completely eliminated by locating compact, maintenance-free, electric water heaters at each lavatory location.

Much has been said and written comparing the operating costs of electric heat and fuel-fired heat. Considering the impressive advantages of electric heat, it is enough that such comparisons indicate that electric heat is within reasonable reach. Operating costs are paid at net from current taxation. Not enough has been said of the vital reduction in capital cost of school buildings built to take advantage of modern electric heat. For every dollar of capital cost, after amortization and interest, the taxpayer eventually pays two dollars or more.

Tradition is not easy to overcome. Costly fuel-fired heating systems with costly structural facilities for their plants and auxiliaries are still being planned for schools which will be occupied, and paid for, over the next 50 years or more. What is urgently needed now in the electrical industry is enough professional foresight and initiative to convince school authorities that such traditional systems are not only excessively costly but already obsolete by the best modern electric heating standards of our own time.

Wm. T. Stuart



Fine craftsmanship and better production stem from easy seeing and uniform illumination. Here is an important project on which Graybar, located in over 130 principal cities, can give you or your customers real help.

Your best source of

EVERYTHING IN LIGHTING

...is Graybar

Whenever you or your customers are confronted with the need for better lighting in any plant, office or warehouse area, talk with a Graybar lighting expert. For, whatever the requirements, he can give an impartial recommendation for the best lighting system for the need—from the most complete selection of lamps and lighting units available from any one source!

The Wakefield "Magic Ceiling," illustrated above, is an example. Units arrive on the job as a complete package: fluorescent strip lighting, straps, channels, grid and diffusers. No preliminary construction is required and the Magic Ceiling can be installed practically overnight.

New lighting developments such as this are constantly being announced by the manufacturers of America's best illumination equipment whom Graybar represents. Some of these are: Benjamin, Curtis, Day Brite, Pittsburgh, Silvray, Smithcraft, Wakefield, Wheeler, and Wilson. You and your customers have direct access to this current progress in lamps and lighting equipment when you work with the nearest Graybar office. 696

Write Graybar for your copy of "NEW INTERIORS FOR OLD"

which shows striking transformations made within a few hours by installing the "Magic Ceiling." This new lighting source comes in stock units to fit interiors of all sizes and shapes.

CALL **GraybaR** FIRST FOR

GRAYBAR ELECTRIC COMPANY, INC., 420 LEXINGTON AVENUE, NEW YORK 17, NEW YORK, IN OVER 130 PRINCIPAL CITIES

Snow and Ice Removed by

Heating Cables

. . . installed at toll collection plazas on three Illinois superhighways.

THIS winter, highway maintenance workers removing snow from the new Northern Illinois Tollways are able to "take five" whenever they approach toll collection plazas. Heating cables embedded in the plaza's toll lanes will have cleared the area for them.

Completed December 23, 1958, the three Chicago-area superhighways have a total of 18 toll plazas. Each toll plaza in the 187-mile system features an electric heating cable installation, providing the project with one of the nation's largest highway de-icing systems to date.

In designing the system, Pace Associates, consultants for the entire project, had to consider these four Chicago-area weather factors: (1) average rate of snowfall; (2) average temperature; (3) average wind velocity; (4) average humidity. Even then, these averages can vary considerably within a given locality or area. This is especially true since the Tollways for the most part are constructed in outlying districts where, because of their elevation, they are subject to severe wind conditions.

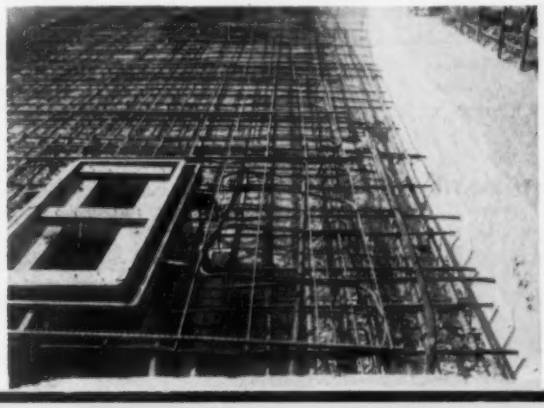
Other factors that had to be studied in designing the system were: (a) An average allowance for heat loss had to be developed since some of the heat supplied by the cables will be dissipated downward and therefore will not be effective in melting snow. (b) It was found that the cost of operating a system designed to melt each snowflake as it hits the pavement would be prohibitive. It was therefore recognized that during certain hours part of the snowfall will be melted and part will accumulate. (c) Studies were made on the estimated number of vehicles that will use the new highways, since traffic, to some extent, will help to dissipate a portion of each snowfall. (d) Manual operation over automatic control was decided upon because in an automatic system, governing thermostats would turn the system on whenever the temperature drops below a certain point, not necessarily when it is snowing.

After considering all of the above factors, plus many other possibilities, (including economies), Pace's electrical department came up with a snow removal system that would operate at about 70% efficiency. This means, for example, if Chicago has an average of 134 hours of snowfall per year (based on weather statistics) the plaza's heating systems will then provide enough heat to melt all of the snow as it falls for 94 out of the 134 hours. This does not mean, however, that the system will be ineffective during the remaining 40 hours. Part of the snow that falls during the 40 hours of severe storms will melt as it falls, part of it will be dissipated by traffic, and the remainder will be cleared when the weather moderates.

Since the entire Tollway system is completely free of traffic signals, stop lights, and grade crossings (except for the 18 toll plazas) vehicles move at relatively high rates of speed (65 mph). There-

WORKMEN are attaching a 91-ft section of heating cable to one of the mesh wire mats that will be embedded in plaza's toll collecting lanes to keep them clear of ice and snow. The cables are bound to the mats with plastic tape.

CLOSE-UP VIEW of wired mats as they are installed on reinforcing iron 8 ins. above roadway's sub-grade. Thirteen mats are used to cover a distance of 8 ft in each lane. Photo was taken just before concrete pour began.



TESTING heating cable installation for continuity and grounds takes place before, during and directly after concrete pour.

EQUIPMENT used for testing is a home-made device that consists of a 12-volt auto battery, a 0-2 ammeter (to check for open spots), 0-15 voltmeter (to check for grounds), and three multiple-position toggle switches (to check each phase of the 3-phase, 208-volt circuit).

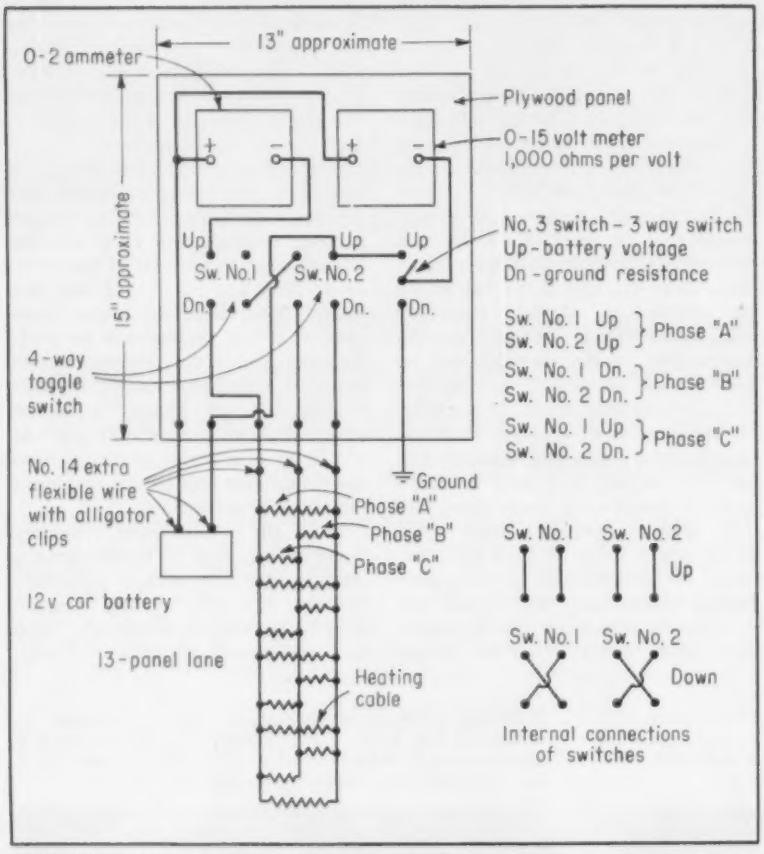
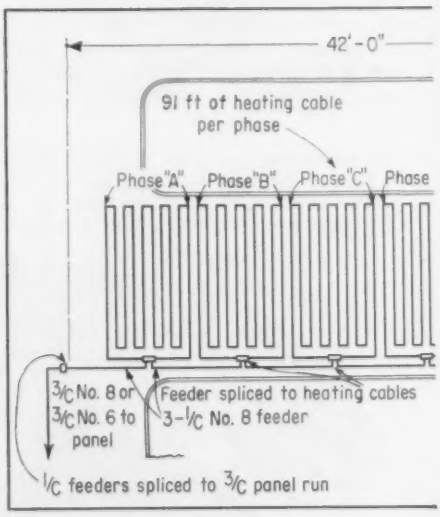


DIAGRAM of home-made panel that is used to test heating cable installation before, during and after concrete pour. Device will also be used to make yearly maintenance tests.

SCHEMATIC DRAWING of a typical toll collecting lane's heating cable installation. Thirteen 5-ft by 8-ft mesh wire mats each containing 91 ft of heating cable are installed throughout the 84-ft lane just before concrete is poured. Note the three 1-conductor direct burial feeder cables that tie the mats together.

fore, when snowy or icy conditions exist, a great hazard would be introduced at each of the toll barriers if traffic approaching the plazas tried to stop unless non-skid traction were provided. The heating cable installation not only keeps the lanes in non-skid condition, but also eliminates the necessity of sanding, cindering, and the use of salt. These latter methods are at best only partially successful in preventing accidents, while the costs of keeping the lanes sanded or salted and then removing the sand or salt are comparable to the costs of operating the more efficient electrical installation.

The electric snow-removal system besides assuring clear, safe traffic lanes, prevents splashes on electronic toll equipment that may

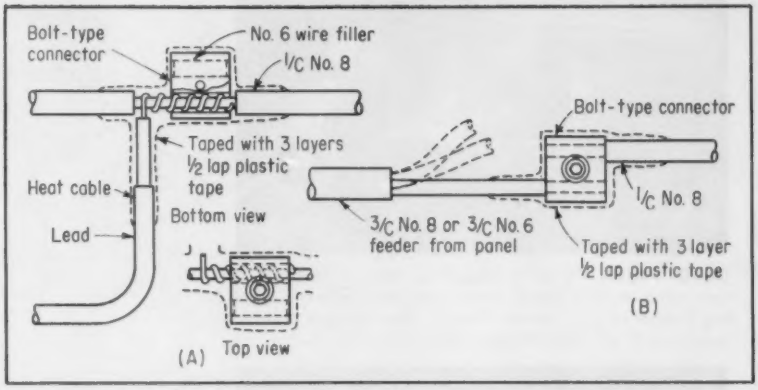


not function properly if covered with icy slush. The embedded de-icing system also solves the problem of plowing snow from lanes whose traffic signal control treadles extend above pavement level.

The 18 toll plazas vary in size by the number of lanes involved, but in general the heating cable design per lane remains the same. Each lane has a total of 1,183 ft of No. 19 AWG, 600-volt (nichrome wire with lead and plastic outer covering) heating cable installed over a distance of 84 ft. Passenger car lanes are 8½ ft wide, while those for trucks are 2 ft wider. The truck and auto lanes are separated by concrete islands which hold automatic toll collection equipment or manual collection booths, plus traffic signal lights.

Installing the cable required close coordination between electricians and the concrete finishing men. The islands were poured first and then the lanes. Just before each lane is poured, electricians and ironworkers put in place 13 5-ft by 8-ft mesh wire mats, each containing 91 ft of heating cable. The 91-ft sections of cable are formed to make five loops per mat on 6-in. centers. This varies at center of lanes under canopies where less heat is required. Cables are bound to the mesh mats with plastic tape to maintain the 6-in. spacing which insures the lanes of the predesigned rate of 20 watts per sq ft.

In each lane three 1-conductor direct burial feeders tie the mats together. Each 91-ft length of heating cable is spliced open to the feeder cables by means of bolt-type connectors which are taped securely and waterproofed to keep out moisture during concrete curing period. Where the feeder cables are run through concrete islands and under traffic control signal treadles, they are protected by lengths of conduit.



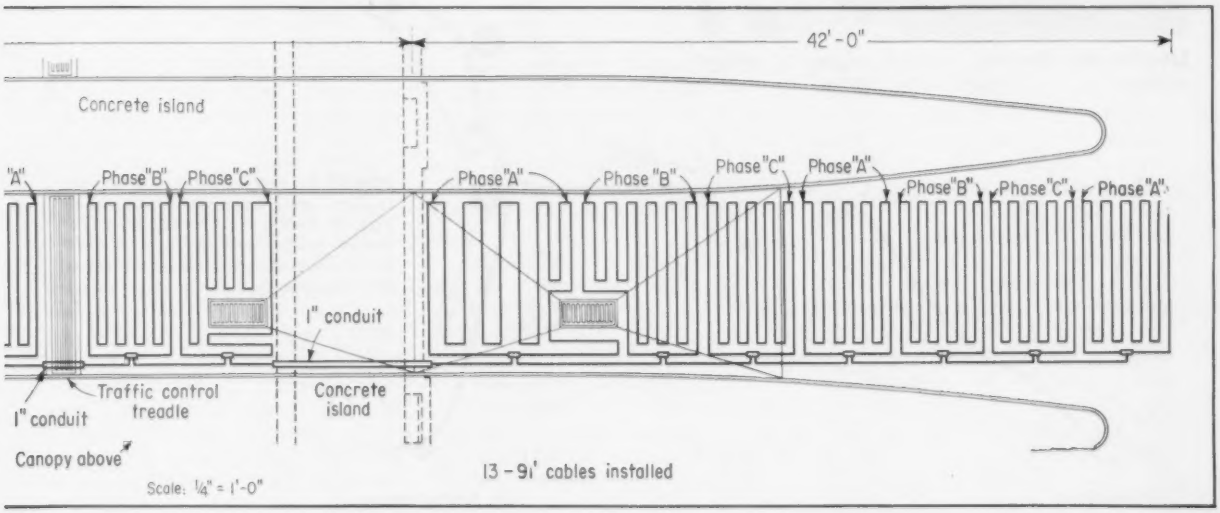
DETAILED DRAWING of direct burial cable splices shows method used to assure moisture-tight connections. (A) shows how the 91-ft sections of heating cable are spliced to one of the three phases carried by the 3-1/C direct burial lane feeders. (B) shows method used to splice 3-conductor direct burial home run feeder to three 1/C, 3-phase heating cable feeders.

After mats are in place and all connections are made, the system is tested for continuity and grounds; then the concrete pour is started. When the concrete is screeded to a finished pavement level of 10 ins., the mesh wire mats holding the heating cables will be 8 ins. above sub-grade and 2 ins. below finished grade. The continuity and grounding test started earlier is carried on throughout the entire pouring and finishing process; and at no time before, during, or directly after the pour are men or heavy equipment allowed on the concrete.

The equipment used for the testing operation is a home-made device that consists of a 12-volt auto battery, a 0-2 ammeter (to check for open spots), 0.15 voltmeter (to check for grounds), and three multiple position toggle switches (to check each phase of the 3-phase, 208-volt circuit). The device will also be used to make yearly maintenance checks.

Each lane's de-icing system is manually controlled by a 3-pole breaker which is switched on by an attendant when needed.

Electrical contractors who installed the job were the Main Electric Co. and the Super Electric Construction Co., Chicago area contractors. Aside from the snow-removal system, other electrical equipment installed in the Tollways included plaza approach lighting, electronic toll collecting equipment, intra-plaza and inter-plaza radio communication, and a series of microwa e communication towers.

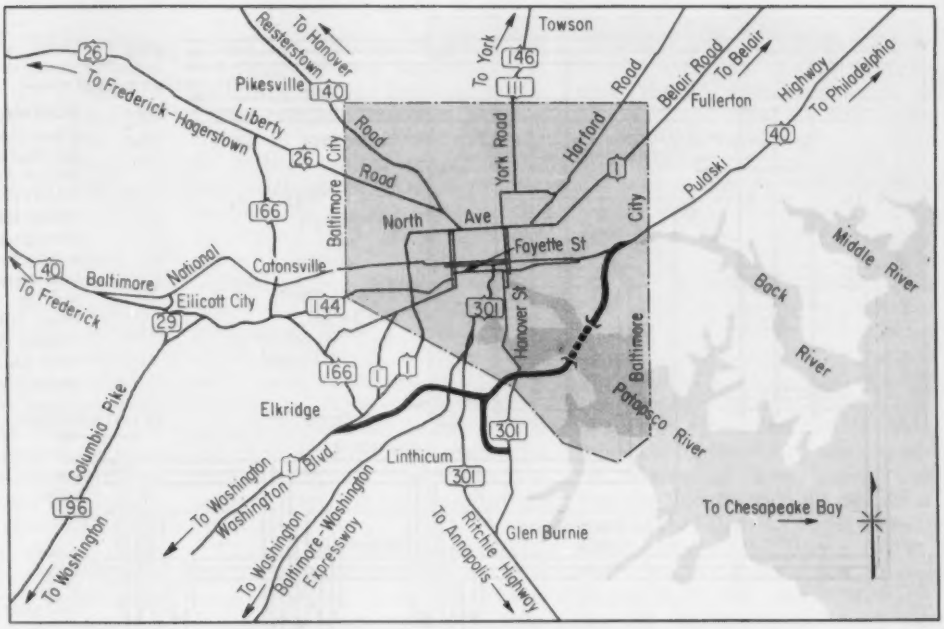


GOOD VISIBILITY is provided by special fluorescent luminaires to help speed traffic over the Baltimore Harbor Tunnel by-pass safely. Brightly lighted signs provide guidance at all interchanges (photo location 1).

ROADWAY is uniformly lighted by four-lamp General Electric fluorescent luminaires installed 30 feet above the roadway, mounted on davit-type poles at 25-degree angle (photo location 2).

LIGHTED APPROACHES to tunnel embrace 17 miles of roadway and interchanges (photo location 3).

POWER for approach roadway lighting is distributed from ventilation buildings, at each end of tunnel, to transformer vaults along roadway at 4160 volts, 3-phase, over two sets of 3 No. 4RR 5kv cables.



BY-PASS HIGHWAY through Patapsco River tunnel keeps through traffic between Philadelphia and the west or south out of a congested downtown Baltimore, cuts travel time through the City from 55 to 12 minutes

Urban By-Pass Highway Lighting

Lighting of roadway, approaches and interchanges of new Baltimore City by-pass represents an important design factor of the $130 million controlled-access Baltimore Harbor Tunnel project.

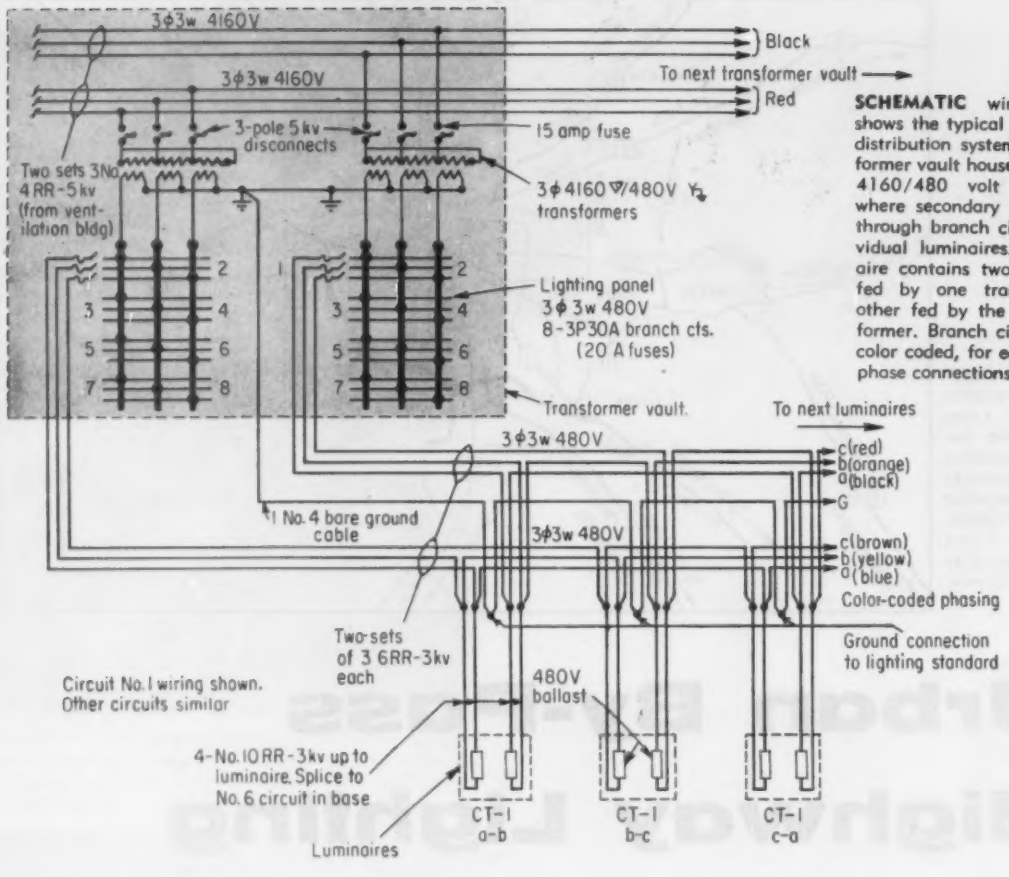
By Ernest F. Siegel, *Chief Mechanical-Electrical Engineer, Green Associates, Inc., Baltimore, Md.*

ROADWAY lighting represents an important facet of the recently completed Baltimore Harbor Tunnel project. It contributes directly to night driving safety. It provides good visibility, adequate lighting to offset the distracting effects of background illumination, and accents and makes readily discernible points of entrance and exit to the by-pass highway. This project embraces a 6300-ft long twin-tube tunnel under the Patapsco River, 17 miles of roadway, 12 interchanges and 53 bridges. It also provides a convenient by-pass around the congested downtown area of Baltimore for all traffic between arteries leading north, south and west of the Monumental City. This by-pass cuts driving time through Baltimore from 55 minutes to less than 12 minutes for motorists driving between Washington and Philadelphia.

Approaches to the Baltimore Harbor Tunnel are lighted to a maintained illumination level of 0.6 footcandles. This illumination is provided by a total of 845 4-lamp 6-ft fluorescent luminaires.

Fluorescent luminaires were selected for this lighting project only after careful analysis of all types of roadway lighting equipment, and of the results obtained on other high speed roads. Fluorescent units have the advantage of low lamp replacement costs. Further, the 4-lamp luminaires selected make it possible to feed two lamps in each luminaire from a separate circuit. This assures continuity of roadway lighting even if one circuit fails. It also permits operations at 50% of lighting intensity during periods when traffic density is light.

Considerable study was given to the selection of luminaires and lighting standards. An effort was made to design a luminaire which would closely approximate units commercially available at that time,



SCHEMATIC wiring diagram shows the typical branch circuit distribution system. Each transformer vault houses two 3-phase 4160/480 volt transformers, where secondary is phased out through branch circuits to individual luminaires. Each luminaire contains two ballasts, one fed by one transformer, the other fed by the second transformer. Branch circuit wiring is color coded, for ease in rotating phase connections to luminaires.

yet which would eliminate certain shortcomings which had been encountered on these units. The final design provided a luminaire which is insect-proof, can be relamped in place with very little effort, is adjustable in both the vertical mounting plane and by rotation about its central axis, can be mounted on davit-type poles without visible hardware, and can withstand 110-mile-per-hour winds. A special polyurethane foam gasket was developed to seal the luminaires against moisture or insects.

Great care was given to the design of the lighting standards. From the outset a clear design tapered davit-type pole appeared desirable, in order to keep the lighting equipment design harmonious with the modern appearances of this roadway. The special design standards finally adopted are tapered steel tubes, davit-type, with a curved section having a 12-ft radius and a mounting tenon attached tangentially at the end of this section. These standards were made and supplied by Union Metal Company. The special fluorescent luminaires, supplied by General Electric Company, are mounted at a height of 30 ft above the roadway at an angle of 25 degrees from the horizontal to assure maximum efficiency in light distribution.

Continuous lighting is installed on all roadways in urban areas where background lighting from homes or commercial illuminated signs exist which might affect the motorists' vision. Where the roadway passes through rural areas, the lighting is limited to ramps and the roadway section in the immediate vicinity of interchanges. Underpasses are illuminated with single-lamp subway-type Crouse Hinds luminaires, mounted on the walls of piers. These units are fed from alternate circuits. Directional roadway signs are floodlighted by weatherproof fluorescent floodlight luminaires installed below and in front of the signs.

Power for Lighting

A preliminary economic study, embracing available power locations and electric energy rates, was made to determine the most efficient and economical system for electrical power distribution for lighting. This study indicated that it would be advantageous to feed the lighting from switchgear housed in the two ventilation buildings. These buildings are located one at each end of the tunnel proper and house the ventilation equipment for the tunnel, which requires a large amount of power. This method of servicing the roadway lighting loads permitted primary metering and operation at minimum power rates. Power to the ventilation buildings is brought in by the Baltimore Gas & Electric Company (local electric utility company) from four separat feeder loops, thus assuring reliability of service. In addition, by feeding the lighting load from the two ventilation buildings, control of the lighting installation for the entire project from two points was made practical and possible.

Power for lighting is distributed from the ventilation buildings at 4160 volts 3-phase, using No. 4 direct buried cable in trenches paral-

leling the roadways. Where cables cross the road, or where installed in structures, they are encased in asbestos cement conduits. On all 53 structures on this project, the operational as well as spare conduits are carried in the parapet walls with pull and connection boxes installed in the parapets.

Transformer vaults, located on slopes at the side of the highway and spaced approximately one mile apart, are used to reduce the voltage from 4160 volts, 3-phase primary, to 480 volts, 3-phase secondary. These vaults are equipped with cutout switches, and fused branch circuit cutouts, to permit isolation of any one of the secondary circuits. No. 6 direct buried cable is used to distribute 480-volt power to the lighting standards. Each lighting standard is equipped with two 2-lamp ballasts, mounted in the four-lamp luminaire, and each ballast is fed from a different circuit. Manual circuit breakers located in each of the ventilation buildings permit the operators to switch off two lamps in each luminaire over the entire roadway lighting system.

The complete roadway lighting system is turned on automatically by a time switch controlled by astronomic time clocks, and the control circuits are further arranged for future installation of photoelectric controls.

This roadway lighting installation consists of 845 standards and luminaires. These required a total of 590,000 ft of No. 4 high-voltage and a total of 895,000 ft of No. 6 low-voltage cable. A continuous ground network consisting of 175,000 ft of bare No. 6 copper wire, ground rods, and accessories connects all electrical equipment of the installation.

The results of this roadway lighting, as observed to date, have been most gratifying. Light distribution is uniform, and despite the relatively low lighting intensity of 0.6 footcandles, the visibility is excellent. Where sections of the roadway lighting start or stop, the spacing between poles is graduated so as to guide the motorist carefully in or out of the illuminated area. The opinion has been expressed that this roadway lighting installation will play an important role in keeping the number of accidents on this high-speed road facility at a low rate.

The J. E. Greiner Company, Baltimore, were general consultants for this project, and Green Associates, Inc., designed and specified the roadway lighting system. The roadway lighting and electrical distribution system installation work was done by three different electrical contracting firms, under three separate contracts. These firms were: H. A. Harris Co., Baltimore, Lovette Electric Co., Durham, N. C., and American Electric Co., Washington, D. C. The cost of this lighting and related electrical work was about 1.3% of the total project cost, not including electrical work for the tunnel proper.

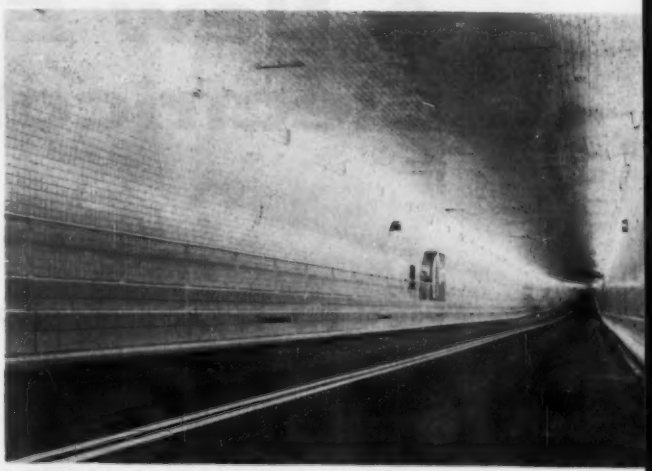
LIGHTING For Baltimore Harbor Tunnel

Two continuous rows of single-lamp fluorescent luminaires were used to light each tube of the 6300-ft long twin-tube Baltimore Harbor Tunnel, which runs under the Patapsco River in South Baltimore. These rows of luminaires are mounted one on either side of the tunnel ceiling, near the tunnel wall.

Each luminaire contains two 6-ft T8 slimline lamps, installed end-to-end in a 2-in. diameter pyrex tube, and a 2-lamp transformer. Luminaires are 12 ft 6 ins. long, and are run continuous. The Pyrex tubes are 12 ft long, and are sealed in the transformer housing at each end to permit lamps, contact springs, insulators and contacts to be enclosed in a single member.

Power is supplied to the tunnel luminaires by series circuits, which incorporate saturable core reactors arranged to vary the lamp current over a range of from 100 to 450 ma. This makes it possible to vary the lighting level throughout the tunnel to meet varied requirements. On bright days lamps near the tunnel entrances are operated at 450 ma, or full intensity, to minimize the contrast between bright outdoor illumination and the lower lighting intensities within the tunnel, and to aid motorists in adapting their vision to the lower intensities. On dark and overcast days, lamps at tunnel entrances are operated at a medium current value, and during the night this current is further reduced to 100 ma.

The Baltimore Harbor Tunnel, owned and operated by the Maryland State Roads Commission, was designed, specified and constructed under a separate contract from the controlled-access approach roadways and interchanges. The Greiner Company of Baltimore were engineers for this project, with Singstad and Baillie, New York, as special consultants. The tunnel lighting equipment was supplied by the Simes Company, College Point, N. Y. The electrical work was done by Nager Electric Co., Brooklyn, N. Y., and Keystone Engineering Corp., Philadelphia, Pa., electrical contractors.



LIGHTING in the two-tube tunnel under the Patapsco River, link of the Baltimore Harbor urban by-pass, City of Baltimore, consists of two continuous rows of 6-ft T8 slimline lamps in fluorescent tunnel luminaires mounted on the tunnel ceiling, one row on each side of each tunnel. Lamps are operated on series circuits at variable currents ranging from 100 ma to 450 ma.

WILLIAM J. WHEELER, SR. president of The Maintenance Co.

The Maintenance Co., Inc., begins

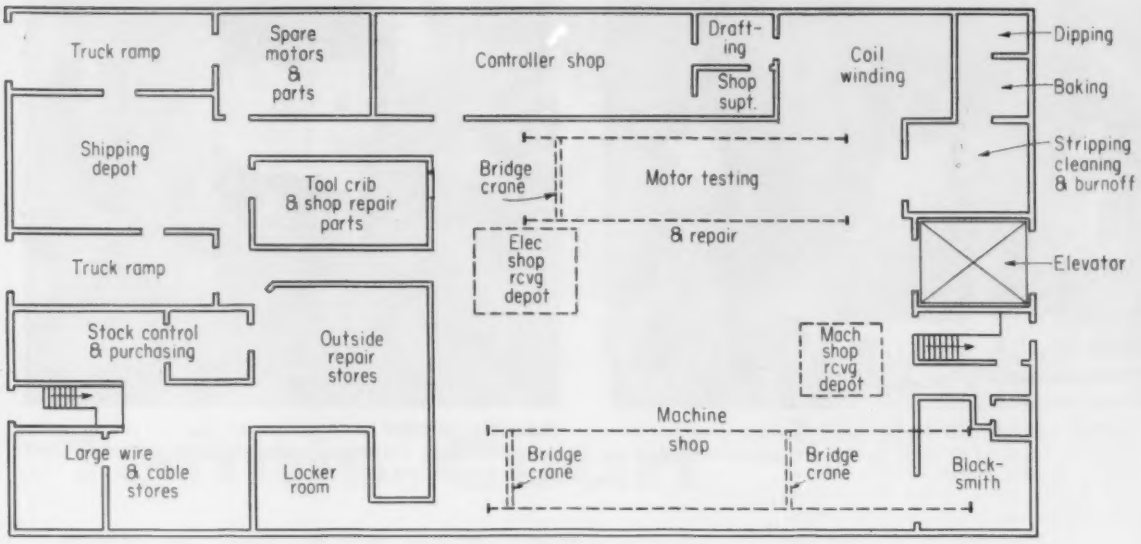
A New Era of Electrical Service

in new surroundings

One of New York's first service organizations has begun its 62nd year of electrical operations in a new plant with vastly improved repair and maintenance facilities.

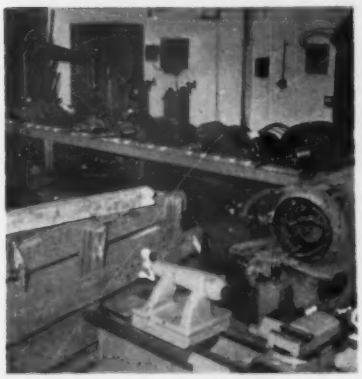
APART of the New York scene since 1897, The Maintenance Co., Inc., began operations this year in a new large building in Long Island City. After 37 years in Midtown Manhattan, with electrical and mechanical shops and stockrooms spread over five floors and with truck movements plagued by ever-increasing traffic congestion, the company is now located with all its operating departments at street level, with two truck bays for convenient loading and unloading of vehicles. Geographically, the new site is resulting in faster service because of ready access to new main arteries of travel and transportation via bridges, tunnels and highways to all points in the New York Metropolitan area, important to any operation involving elevator, motor, communications, air conditioning and refrigeration maintenance and repair. Additional operations include elevator control and device manufacturing, wiring for light and power, specialized consulting engineering service, and industrial plant layout and moving.

President William J. Wheeler, Sr., now in his 41st year with the firm, is assisted in overall direction of the company by his sons, vice presidents William J. Wheeler, Jr., and Richard M. Wheeler. Respons-



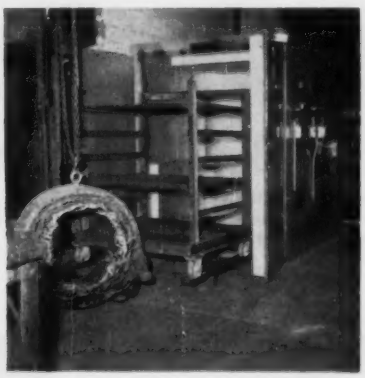
SHOP LAYOUT

FLOOR PLAN of shop area. Generous aisle space facilitates movement of equipment from truck ramps through entire shop. Ten-ton elevator permits unloading of large equipment at truck-bed level for direct delivery to shop area where work is to be performed. Previously, where operations were spread out over several floors large motors, and generators had to be completely repaired in the first-floor machine shop, weight and size preventing their being moved to appropriate areas. Bridge crane system handles work in progress within each shop area.



ELECTRIC SHOP RECEIVING DEPOT. Equipment is held here after unloading from trucks until repair operations begin, while waiting for parts, or between phases of repair or assembly.

ELECTRIC BAKING OVEN, rated at 35 kw, is located adjacent to varnish and epoxy resin dip tanks. Flat car on rails permits easy loading. Mainco also has facilities for Class H rewinding.



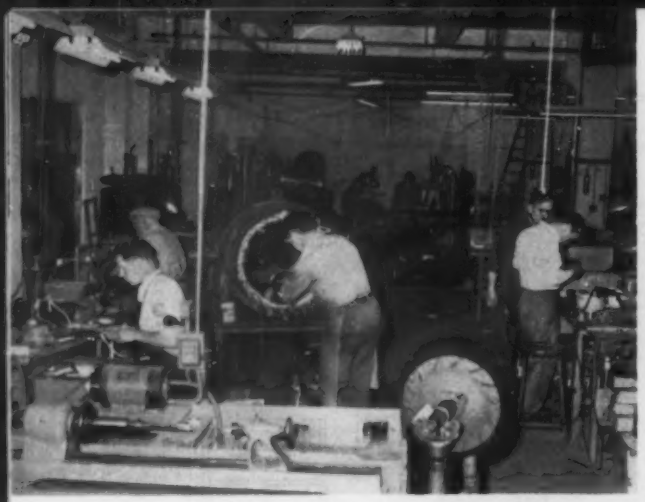
BURN-OUT OVEN which completely disintegrates insulation without direct flame is loaded by means of track-mounted dolly. The new oven is being tested as a replacement for the open gas flame method.

ibility within the shop is assumed by a shop superintendent; individual working foremen of the motor and machine shops report to him.

The main floor of this new facility is laid out to handle efficiently the flow through the shop of equipment to be repaired. Unloaded from trucks in ramps completely inside the building, equipment is appropriately tagged, stacked on pallets, and moved by hand lift trucks to a special area designated as the receiving depot. Paperwork is initiated in the main office which, with the executive offices, occupies the second floor. Trouble or work to be done is noted, where indicated by the customer; otherwise it is inspected or tested and instructions added to the worksheet.

The machine shop handles machining or blacksmith work required in connection with repair activities, industrial millright work originating from elevator maintenance, and considerable work not basically electrical in nature. The blacksmith shop adjacent to the machining area is equipped to handle operations such as metal spraying, babbitting, and gas and electric welding.

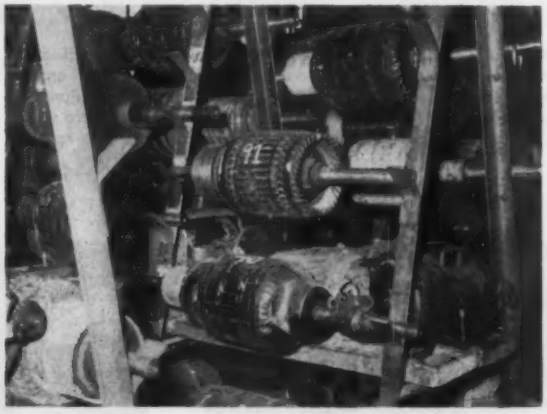
To keep abreast of current developments and insure highest quality work in all its operations, the com-



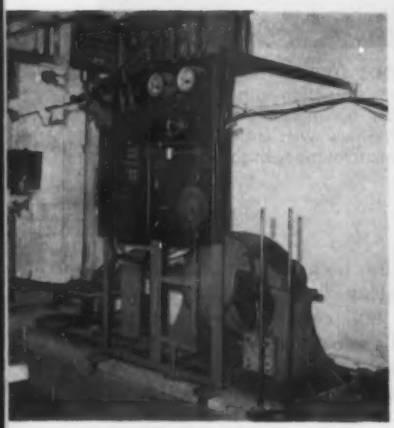
MOTOR REPAIR and testing area provides generous floor space for handling of large motors and generators. Machine shop is in background.

BLACKSMITH SHOP has provisions for gas and electric welding and forging, babbitting, and metallizing. Armature shaft is being metallized here.

COIL WINDING department handles magnets and solenoids as well as all motor armature and stator work required for repair activities.



SPARE MOTORS and components are stored for use as direct replacements for customers' equipment or on a temporary loan basis until repairs on like equipment are completed. DC armatures in foreground are elevator motor spares.



TEST EQUIPMENT located along one wall includes (left) a small dynamometer for motors up to 3 hp, a panel providing a variety of voltages plus facilities for hy-pot testing, and (right) a large dynamometer for motors of 5 to 50 hp. Partially visible at extreme left is dynamic balancing equipment.

pany maintains a continual training program, covering such topics as elevator and electrical maintenance and industrial electronics, as well as special basic classes for helpers and new employees.

Accompanying photos show some of Mainco's facilities in their new surroundings. President Wheeler believes the new plant will aid materially in furthering the company's long-established principles of fundamental policy: (a) integrity must never be compromised; (b) service must be directed toward genuine preventive maintenance assuring uninterrupted, economical operation of equipment; and (c) the company must be first in anticipating new dimensions in maintenance service in step with the coming new era of technical progress.

FLUORESCENT lamps in General Electric floodlights provide a uniform intensity of 10 footcandles without spill light into adjacent areas on two outdoor tennis courts at the Tucson (Arizona) Racquet Club.

Fluorescent Lamps Provide

Tennis Court Floodlighting

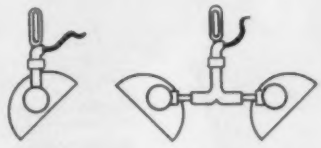
at Tucson Racquet Club

A NEW floodlighting technique was used to light two outdoor tennis courts recently at the Tucson (Arizona) Racquet Club. Believed to be the first installation of its type, it consists of continuous rows of single-lamp fluorescent floodlights, with one row on either side of each court, two rows to each of the two courts lighted.

Each continuous row consists of six General Electric double 8-ft Fluoroflood fluorescent luminaires, installed end-to-end, and suspended 25 ft above ground on a 120-ft span catenary between two 30-ft high steel poles. A single row (Type A) is used on the outside of each of the two adjoining courts, and a double row (Type B), consisting of two single rows installed back-to-back, is installed on the center line between the courts. This arrangement provides a uniform lighting intensity of ten footcandles over the entire playing area of each court.

Each floodlight is equipped with a single 96T12CW/RS high output General Electric lamp, and operated from a two-lamp ballast (one ballast for two floodlights). Electric power is supplied by a 3-phase system, with each third 2-lamp ballast connected to the same phase. This hook-up completely eliminates stroboscopic effect.

The six poles used are each 34 ft long, with 4 ft set in a concrete base. These poles consist of a 21-ft section of 3½-in. o.d. steel pipe, a 11½-ft section of 3-in. o.d. steel pipe telescoped 30 ins. inside the 3½-in. size, and a 5½-ft section of 2½-in. o.d. steel pipe telescoped 18 ins. inside the 3-in. size. Catenaries for the two single rows of floodlights are ⅜-in. 7-strand common steel wire; and for the double row of floodlights, ¼-in. size common steel wire.



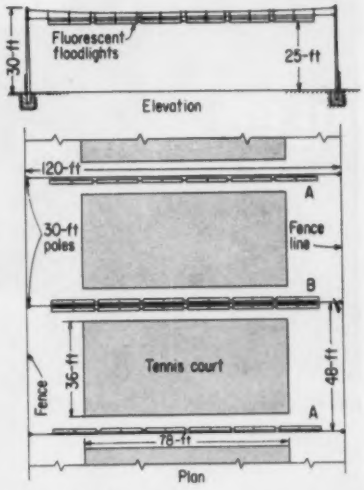
FLOODLIGHTS were installed in single continuous row (Type A) on outside of each court, and in double (Type B) continuous row between courts.

UNIT for one lamp is complete with junction boxes for direct mounting to standard ¾-in. conduit.

The total connected load per court is 2.95 kw, which provides an intensity approximately equal to that of eight 1000-watt conventional incandescent lamp floodlights. If used four hours per night, this means a saving of 20.2 kwhr per night per court.

An important feature of this installation is that practically all of the light is directed to the playing area of the courts, with almost none falling outside the "foul" area. This was important on this installation since the Tucson Racquet Club is located in an area where it was desirable to prevent spill-over, or light glare, on adjacent property.

Initial reaction to the new form of lighting for night play on these outdoor courts has been very favorable, according to Boyd M. Morse, Racquet Club president. He quotes one authority, Adrian Quist of Australia, as saying that this fluorescent floodlighting system is "far better than conventional floodlighting for night tennis".



LIGHTING LAYOUT for two outdoor courts consists of 12 two-lamp fluorescent floodlights per court, installed 25 feet above ground at either side of court in continuous rows.

Modern electrical construction demands . . .

Safe Transporting of Heavy Equipment

Detailed planning and careful handling procedures—essential to safe and economical transporting of heavy electrical equipment—backed successful transportation of a 200-ton generator stator to a power plant in Somerset, Mass.

By R. M. Wood, *Construction Manager Stone and Webster Engineering Corp., Boston, Mass.*

200-TON STATOR is loaded onto the lighter "Catskill", at Jersey City, for sea voyage to Massachusetts. J. R. P. Perry, N. Y. district chief inspector for Stone and Webster and Paul Couillard, General Electric Company, watch as floating derrick makes transfer from railroad flat.

THE movement and handling of power generating equipment is an exacting phase of electrical construction necessitating long term planning and careful execution. The story behind the recent successful shipment, unloading and setting-in-place of a 200-ton generator stator is typical of the special attention required for this type operation.

This stator will form a part of a 100-kw extension to the Somerset Generating Station of Montaup Electric Company designed and now under construction by Stone & Webster Engineering Corporation at Somerset, Mass., on the west bank of the Taunton River opposite the City of Fall River. The turbine-generator unit was manufactured by General Electric Company in Schenectady, N. Y., and is designed for an electrical rating of 147,058 kva, 3-phase, 60 cycles at 15.5 kv. The unit is being erected by Stone & Webster personnel under the direction of manufacturer's representatives.

Planning

Soon after the order for this unit was placed in May of 1956, Stone & Webster, in collaboration with General Electric Company, started making plans for its transportation from Schenectady and its installation at the station site. Although there is no direct rail connection to Somerset, a study of existing transportation methods and facilities revealed that with the exception of the generator stator all components

UNLOADING OPERATION at dock in Massachusetts begins with floating derrick lifting stator from the lighter which is against the dock. When the stator was clear of lighter, the lighter was removed and the derrick was moved into the dock, with the stator suspended in the air.

BALLASTED DERRICK lists heavily under tremendous weight of the stator, as transfer is made from lighter to cribbing arranged on dock in Massachusetts.

of the unit ranging in weight up to 50 tons could be forwarded by rail to within a reasonable trucking distance of destination and, therefore, presented no serious problem. The stator, however, with overall dimensions of 14 ft high by 13 ft wide and 23 ft long was too large for clearances provided by eastern New England railroads and was too heavy for trucking over highways leading to the plant. With through shipment overland ruled out, a partially water-borne routing was necessary.

The layout of the Somerset Station is such that docking facilities are located at the south end of the building whereas the point of installation of the new turbine generator is at the exteme north end. If the stator were landed on the existing dock, there still remained the problem of transporting it to its final location on a concrete support 35 ft above the ground floor of the turbine room and at the opposite end of the building.

Some consideration was given to construction of another dock near the north end of the building from which the load could be moved on rollers into the building and raised to the level of the turbine support by jacking and cribbing. The cost of dock construction and the necessary dredging of a channel, added to the fact that the dock would be of no material value to the plant in the future, made this alternative economically unsound. Also ruled out because of road grades, clearances and underground structures was the possibility of trucking the stator from dock side to the north end of the building.

The only remaining alternative was to move the unit on rollers a distance of approximately 250 ft from the dock into the south end of the building, under the station crane and from there overhead the entire 400-ft length of the building to the turbine support—passing, en route, over one of the previously installed generating units. However, the existing station was equipped with a single bridge type crane of 100-ton capacity, obviously inadequate for the lift required.

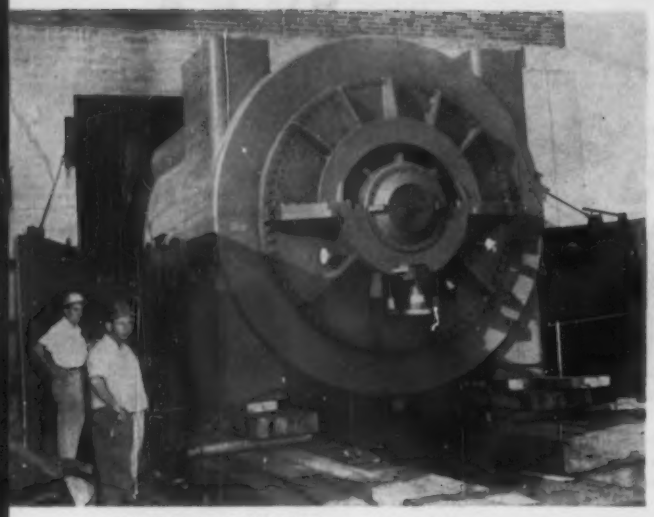
Engineering studies of the design of crane runs and supporting steel, a part of which was erected in 1925-26, as well as the crane power supply established the feasibility of installing a second crane of 100-ton capacity. Considering the fact that two cranes of this capacity, operated in tandem, could handle the stator for the new unit as a single lift, plus the advantage of having additional facilities available for future plant maintenance, justified the cost. A second crane was, therefore, incorporated in the station planning and had been purchased and installed while the turbine generator unit was still in the early stages of manufacture.

It had been determined that rail transportation of the stator was feasible from Schenectady to the Jersey City waterfront. A special heavy duty flat car belonging to the Reading Railway System was scheduled for this leg of the journey. Several months prior to shipment, arrangements were made with Merritt, Chapman & Scott Corporation to transport the unit by lighter to Somerset.

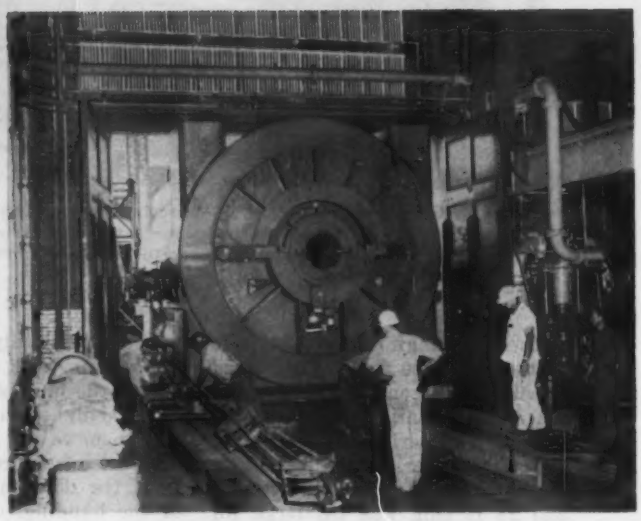
CAUTION TO ESTIMATORS

Because modern electrical construction so frequently involves transporting and handling of heavy equipment, proper consideration of such handling should be made in the electrical contractor's estimate of his job. In many cases, the size and/or nature of equipment will require the services of an expert rigger to assure safe, efficient handling. In other cases, there may be special work procedures that the contractor's mechanics must follow. Careful planning and detailed arrangements must be made for all handling of heavy equipment. And the estimator must fully account for the cost of all such special work. Failure to plan for properly moving and lifting heavy equipment can result in interrupted job progress, excessive cost of haphazard handling, damage to equipment, life hazards to personnel and even law suits against the contractor. The story here presents a case study in planned movement of heavy equipment, with all details mapped out and cost-accounted for in advance of the actual job.

The Editor



ROLLING OPERATION by which stator is moved into the generating plant makes use of concrete-filled, steel pipe sections for rollers. The generator sits on wooden stringers which ride the rollers.



BLOCK-AND-TACKLE arrangement is used to pull stator into the building. As each pull is made, the rollers are moved from back to front to provide continuation of movement.

Handling Details

In the meantime, plans were being made for receiving the unit and for its subsequent handling. Designs were completed by Stone & Webster engineers for a 28-ft long, 7-ton equalizing beam to spread the load between the two station cranes. Two-inch diameter wire rope slings were selected as they were available and, when arranged in eight parts, provided an ample factor of safety for the weight involved.

Preparations at the plant site were directed by L. T. Larsen, superintendent of construction for Stone & Webster Engineering Corporation, assisted by Dewey Hines, an experienced rigging supervisor who had been transferred to Somerset from other work of the company in anticipation of this operation and other rigging required in power plant construction. Timber cribbing was prepared to receive the stator and timbers for runways were assembled. Rollers were fabricated from lengths of 4-in. steel pipe filled with concrete. Fabrication of the equalizing beam was arranged for, and slings were delivered at the site.

The 100-ton station cranes were thoroughly inspected by the manufacturer's engineers, in preparation for the 212-ton lift, the 12 tons above the stator weight contributed by the equalizing beam and the slings. And the crane hooks were magnafluxed as a precautionary measure.

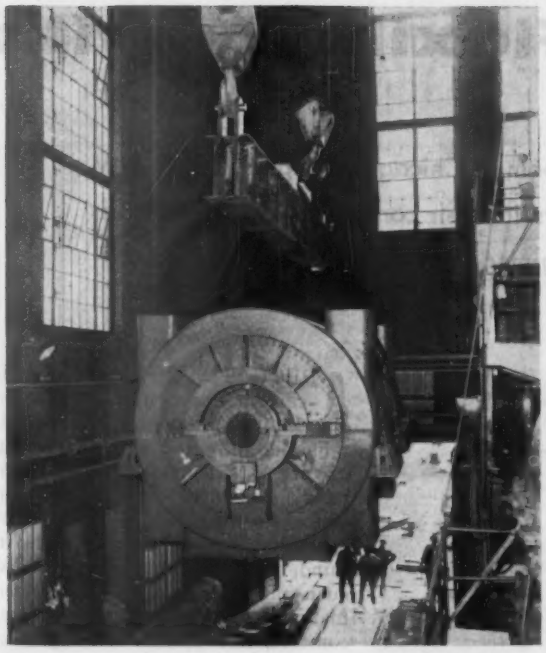
The Trip

On June 26, 1958, the stator was loaded on its special flat car in General Electric Company's Schenectady plant, and the enforced slow-speed trip to Jersey City began. On July 21, the stator was lifted from the car by the 240-ton derrick of Merritt, Chapman & Scott's "Monarch", largest floating unit on the east coast, fresh from drydock and with rigging rereeved and equipment overhauled. After the stator openings were sealed for the voyage, the Monarch's derrick lowered the load to the deck of the lighter "Catskill" where it was secured in position by timber and steel bracing.

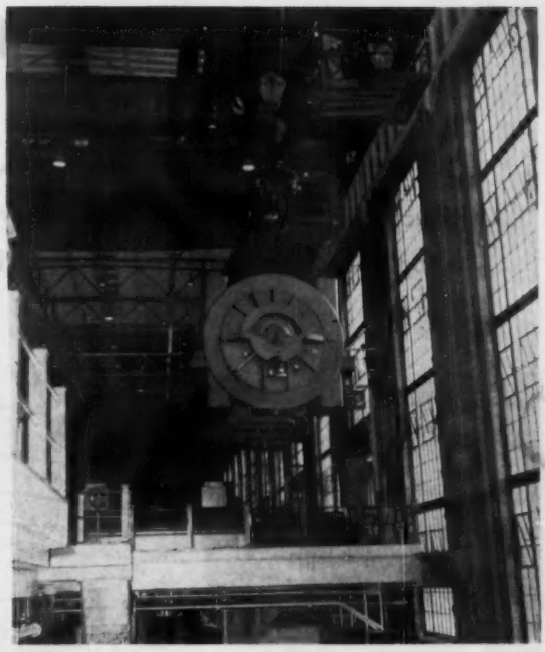
The sea voyage across New York Bay, the East River and through Long Island Sound to Mt. Hope Bay was shrouded in fog but was otherwise uneventful for the two derrick vessels and their radar-equipped tugs. The convoy entered the Taunton River during the evening of July 23, but as the fog still persisted, the vessels tied up at Fall River for the night and moved early the following morning across the river to Montaup Electric Company dock where the crew immediately started removing the stator bracing.

The Monarch's big stick began the lift shortly before noon and raised the stator to the maximum height permitted by the rigging. The steep inboard list caused by the heavy eccentric load was partially trimmed by filling the outboard ballast tanks which also sufficiently increased the height of the load to permit its clearing the bow of the Catskill.

With the load suspended, the Monarch was moved past the Catskill and maneuvered into the dock where she was spotted to land the stator on the cribbing below. By



EQUALIZING BEAM is used to distribute weight of stator between two station cranes during lifting and movement of stator within the building. Heavy cables form sling to support the stator from the equalizing beam.



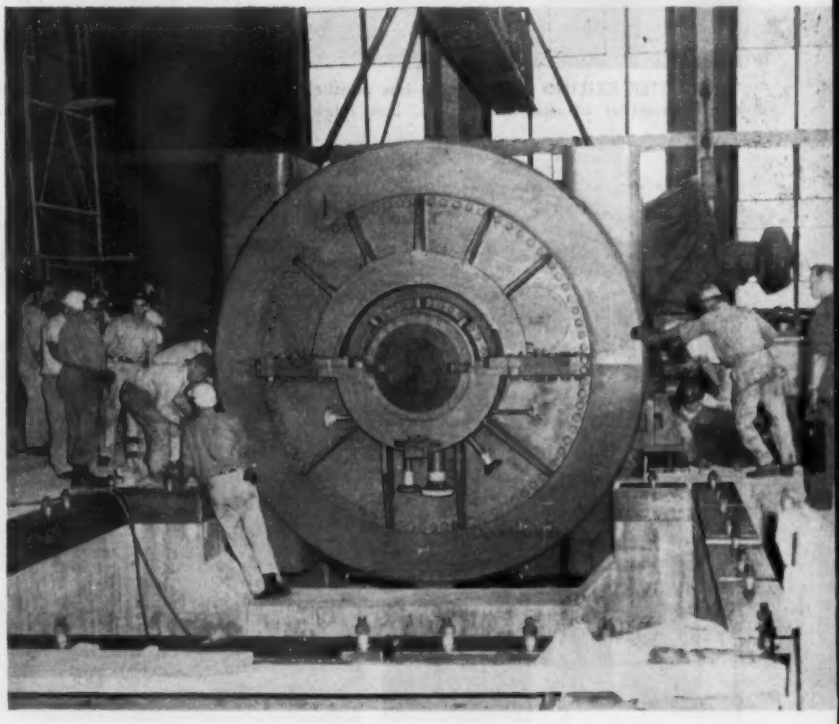
TWO CRANES carry suspended stator down length of building to other end, where it is to be set in position.

5 o'clock, the Catskill and the Monarch were on their way back to New York.

In the Building

Inside the building, the two cranes were linked together by pin connections previously prepared. The equalizing beam was attached to the crane hooks and the main slings rigged to the beam and stator lifting trunnions. Portable telephones were connected by flexible cables between the two crane cabs and the supervisor on the floor. Visual signals were considered inadequate for the precise and instantaneous coordination required. Crane manufacturers' engineers rode the cabs during operations.

The actual lift in the station, the overhead movement to the foundation and the final setting of the stator on the foundation plates was carried out without incident. The careful planning and scheduling that had begun two years earlier, combining construction know-how with the special skills of engineers, traffic men, expediters and craftsmen, really paid off.



IN POSITION, stator is lowered onto its permanent foundation. The driving turbine will occupy the area in the foreground.

Display Flexibility with

Harlo Electric Supply's fixture showroom in Chicago, designed by G & M Electric, combines multi-outlet raceways in flush continuous channels; adds plug-in convenience to rigid supporting medium.

TRIPLE-TIER CEILING in showroom has parallel continuous flush slots for support and connection of display fixtures. Slot lines make interesting ceiling pattern.

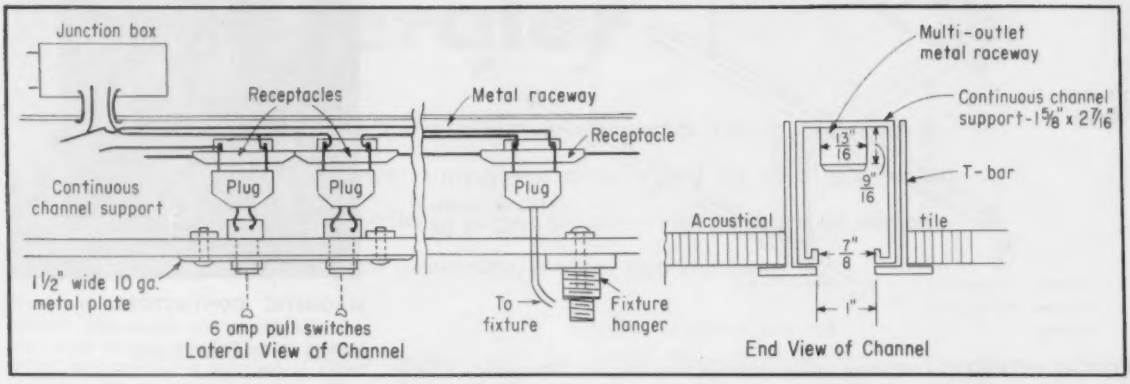
CEILING CHANNELS are rod supported from roof structure; have flexible conduit connections to branch circuit system; provide rigid support medium.

ADEQUATE, convenient electrical facilities, incorporating a unique fixture display technique, highlighted the remodeling of Harlo Electric Supply Company's fire-gutted headquarters on Chicago's west side. With efficient operation and customer service in mind, Harlo management added such plus values as conveyorized material handling, air conditional comfort, and product display flexibility.

Since an important part of Harlo's operation is the sale of commercial and residential fixtures to contractors, architects, engineers and builders, owner L. S. Levin focused attention on the ceiling design of the 2400-sq-ft showroom and 1200-sq-ft office area where more than 500 types of lighting units were to be on display. What he wanted was an esthetic, functional and flexible method of supporting and energizing fixtures with the added convenience of quick, easy replacement to vary display patterns. Hence, he commissioned electrical engineer Morton Gooze (G & M Electrical Contractors, Chicago) to work with architect Bernard Krauss to develop a suitable system. All electrical work was installed by Grand Electric Co., Chicago.

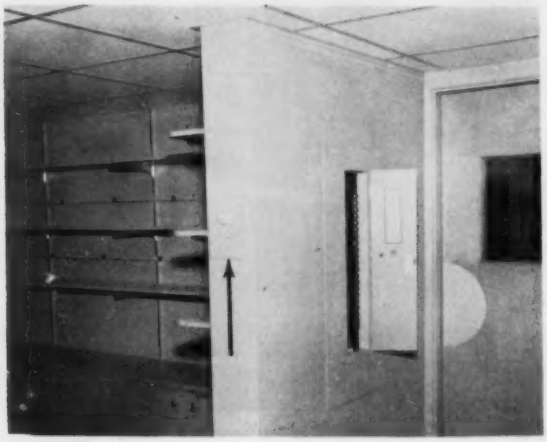
Net result of this collaboration was the installation of a suspended acoustical tile ceiling (three tiers in showroom area) incorporating flush continuous channel fixture supports containing plug-in circuit and control facilities. Gooze's basic design consists of parallel rows (on 2-ft centers) of $1\frac{5}{8}$-in. by $2\frac{7}{16}$-in. continuous channel framing members rod-suspended flush with the ceiling line and running from front to back of the area involved. Rods are supported by lateral channels ($1\frac{5}{8}$-in. by $1\frac{5}{8}$-in.) mounted to bar joists or Flexicore slab as re-

Plug-In Ceiling Channels



SECTION THROUGH ceiling channel showing internal connections to raceway receptacles and relative position of component parts of unique ceiling design.

PIGTAIL RECEPTACLES in wall outlet boxes, shown here by Harlo's L. S. Levin, provide plug-in convenience for bracket-light display. Pigtails fold back into box after connection.



LIGHTING PANEL, one of two 12-circuit units for showroom, is inconspicuously located in appliance display endwall. Dimmer switch (arrow) controls recessed lighting display.

quired by structural conditions. The T-bars of the separately suspended ceiling grid hug and effectively conceal the parallel channels to present an interesting ceiling pattern. Fixture-mounting flexibility is provided by continuous slots of the ceiling channels.

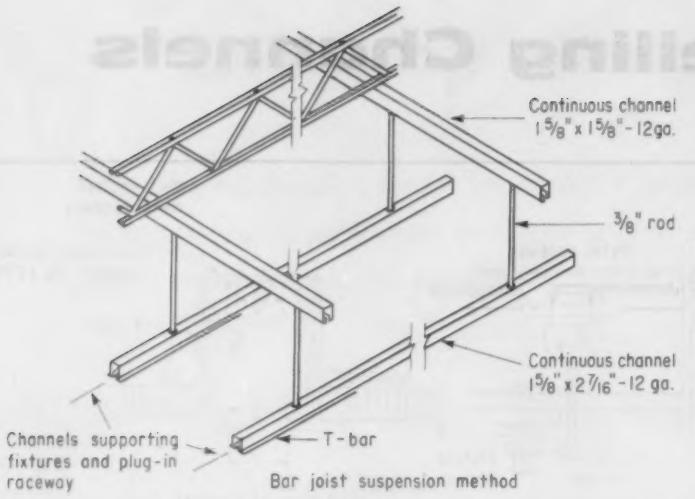
Plug-In Features

To provide the desired convenience of connecting and disconnecting display fixtures, engineer Gooze simply added predetermined lengths of conventional multi-outlet metal raceway to the inner web of the ceiling channels. Circuit receptacles (for fixtures) are located on 3-ft centers with a pair of switch receptacles between to control individual fixtures. Special fixture hangers were developed to fit the channel. Conventional pull-chain switches are mounted in duplex fashion on 1½-in. wide metal plates which bridge the ceiling slots. Fixtures and their switches are simply plugged into their respective receptacles.

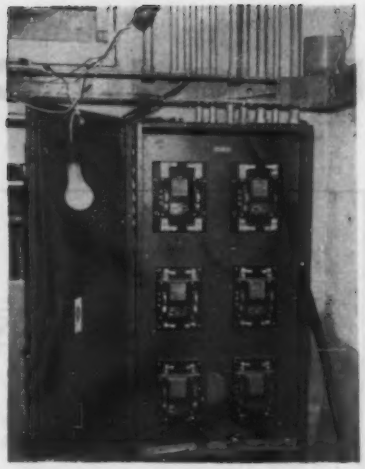
The overall ceiling design combines sturdy, yet flexible, fixture supporting facilities with a 3-ft by 2-ft grid of concealed receptacles in a single system that blends with the basic architectural treatment of the area.

A similar technique was used in the office area. Here, in an office atmosphere, customers can now see, study and compare the illumination provided by the variety of commercial fixtures in use. If desired, fixture type or lighting pattern can be changed quickly and easily.

Most of the channel wiring was done at ground level to simplify installation. Exterior junction boxes and, where necessary, circuit ties were added to the top of the channel. Completely assembled multi-

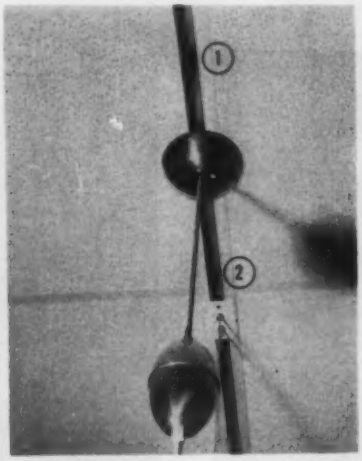


TYPICAL METHOD of suspending ceiling channels from bar-joist construction. Plug-in channels are on 2-ft centers; lateral supporting channels on normal 101-ft spacing.



MAGNETIC CONTACTORS, in panel adjacent to service equipment, control feeders to six lighting panels. Each contactor is operated by a switch at building front entrance.

CONCEALED RECEPTACLES of multi-outlet raceway sections in channels provide flexible electrical connections. T-bar grid (shown partially installed) supports acoustical tile ceiling.



CLOSEUP of finished ceiling channel section shows plug connections (1) for display fixture and (2) its controlling pull switch. Slots and plugs are practically invisible from eye level.

SERVICE ENTRANCE is 600-amp, 120/240-volt, 3-phase, 4-wire. Main disconnect and CT's are in cabinet at left; feeder breakers in panel at right are controlled by magnetic contactors.

outlet raceway sections, including all control wiring, were bolted to the channel interior. After the individual channels were in place, flexible conduit connections were made from the junction boxes to the branch circuit system.

The plug-in technique was also applied to the bracket-light display. Approximately 100 flush outlet boxes are installed in the two walls of the showroom. Each box is equipped with a flat cord connector body on a pigtail. Fixtures are simply plugged into the connector and fastened to the wall. A series of switches in the wall panels control the units.

Master Control

Master control of six lighting panels eliminates the time consuming chore of making the rounds each night and morning to turn circuits off and on or to operate the hundreds of pull and wall switches. Feeders to these panels are controlled by magnetic contactors in a panel adjacent to the 600-amp, 120/240-volt, 3-phase, 4-wire service and distribution facilities in the rear of the building.

Remote operation of these panel contactors is centered in a six-gang switch panel conveniently located inside the front entrance to the building. The last person leaving the premises at night and the first one arriving in the morning merely flip six switches to energize or de-energize the 164 controlled circuits.

The basic electrical system design was predicated on a modern efficient business operation. And there is sufficient spare capacity to handle any anticipated increase in power and lighting requirements.

For isolated electrical systems . . .

Select The Right Generator

Here's how to select the minimum generator rating required for industrial plant power supply—as determined by total connected load and starting cycles of larger motors—with methods of minimizing combined cost of generator, motors and starters.

By Charles C. Libby, *Manager, Electrical Div., Fairbanks, Morse & Co., Freeport, Ill.*

ENGINE driven ac generators are frequently used in industrial plants, offices, and hospitals for standby or emergency power. In isolated locations, such equipment is also used to provide the primary source of power for an industrial plant, as shown in Fig. 1. In those installations, kw rating of the generator and engine hp are determined by maximum continuous load, or lighting kw plus kw input to electric motors.

Total kva capacity of the isolated system is limited by alternator (ac generator) rating, as contrasted to the almost unlimited capacity of large network power supply systems. The kva rating of an isolated industrial generating set must be sufficient to supply both continuous peak load kw at load power factor, as well as instantaneous starting kva requirements of each motor in the plant. See Table I, Secs. 1 and II.

Maximum instantaneous drop in terminal voltage of industrial generating sets usually occurs during motor starting. Thus maximum voltage variation acceptable to the user is a major factor in determining required ratio of alternator rated kva to connected motor hp load. Voltage variation in excess of 5% rated voltage which occurs even occasionally will cause noticeable light flicker and may be objectionable. As shown in Table 1 Sec. III, when light flicker need not be considered, voltage variation less than 25% will be satisfactory in most industrial applications.

Starting kva/hp may be varied over a range of 5 to 1 by selecting motor design and starter type as shown in Table 2. The effect of motor starting kva on voltage variation may be minimized by: 1) reducing kva/hp, or 2) isolating the motor to be started. Isolation may be accomplished electrically, magnetically, or mechanically as shown by the upper half of Fig. 2.

Starting power factor of most polyphase electric motors is so low that only a fraction of the alternator capacity is available to supply the peak kva required at that instant. Percent available capacity is indicated in Table 3.

In selecting an alternator rating, average and peak kw requirements of load must be correlated with: 1) average plant power factor, 2) types of motors and starters required, and 3) maximum voltage variation acceptable during motor starting.

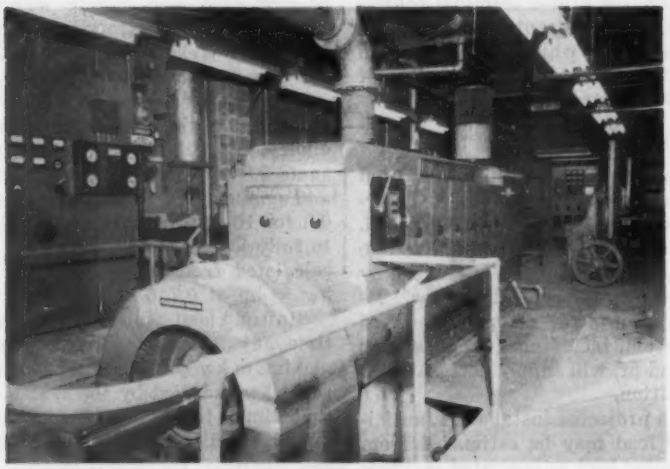


FIG. 1—Primary source of electrical power for industrial plant equipment includes: 360-hp, 514-rpm, 2-cycle dual fuel diesel engine with governor, direct connected to engine-type, 300-kva, 265-kw, 4-wire, 3-phase, 120/208-volt ac Fairbanks-Morse generator and exciter. Switchboard in background mounts circuit breakers and voltage regulator as well as feeder meters. Panel on left automatically meters natural gas fuel, monitors engine temperatures and lubrication system and transfers engine to fuel oil operation in emergency.

Generator Characteristics

Standard ac generators discussed here are rated 5-500 kva, 80% pf, and are equipped with exciters and

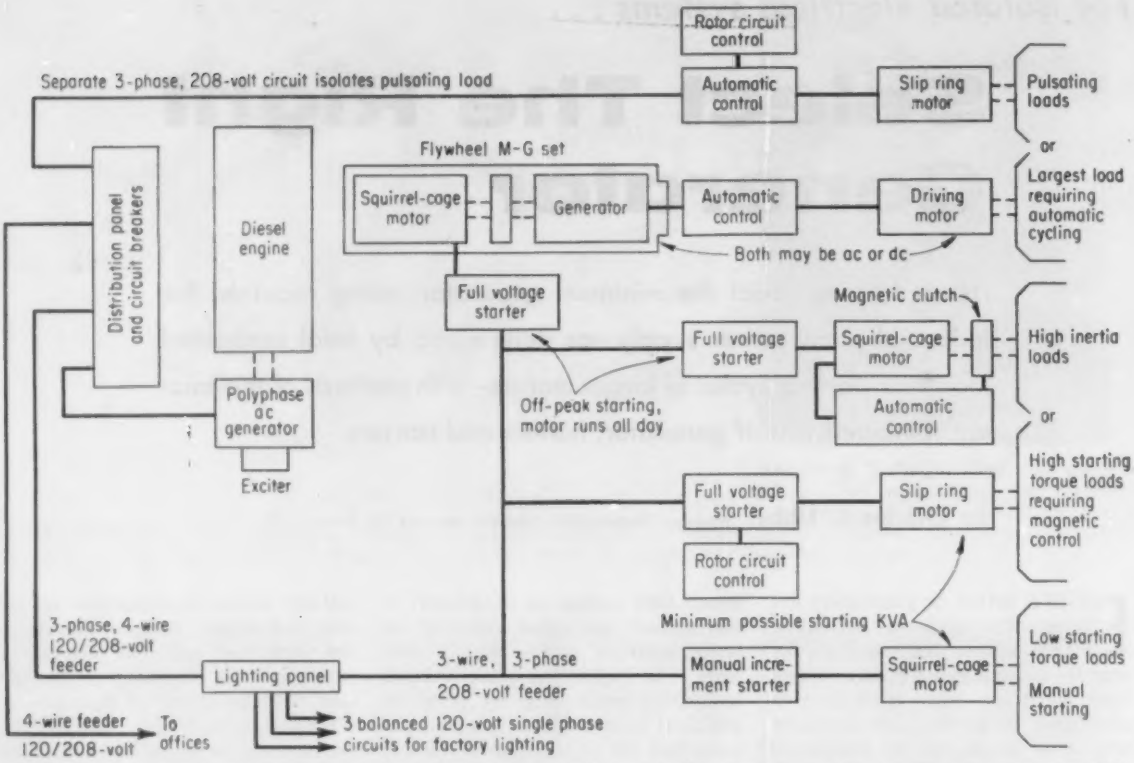


FIG. 2—Single line circuit diagram of typical generating set which supplies isolated factory with power. Only larger motors are shown, plus balanced lighting load. Smaller squirrel cage induction motors, not shown, use across-the-line or reduced-voltage starters. Alternate methods of starting large loads which are described will minimize required alternator kva and reduce voltage variation during load cycles. For instance, the required starting kva of the generator on the flywheel M-G set can be reduced if the "driving motor" is slip-ring type. This would reduce the size of the generator on the M-G set but would not reduce the load on the main engine-generator. Or, the use of a slip-ring motor on the M-G set would reduce its starting kva and would reduce the required kva of the main engine-generator.

voltage regulators. It is assumed that nameplate rated field current (excitation) is not exceeded at any load.

Ratings of alternators include: nameplate full load power in kw, apparent power in kva, current in amperes, and power factor (ratio kw/kva) for operation at a specified terminal voltage and frequency. Nameplate rating of the alternator is related to nameplate hp of the driving engine so that load in excess of alternator rated kw will overload its prime mover. However, unless load kva also exceeds alternator rating, it will not cause overheating of the alternator. Conversely, a load in excess of alternator kva rating which is not in excess of its kw rating will overload the alternator but not the driver.

Output frequency of a single generator is fixed by driver speed which in turn is maintained by the driver's governor. Generated voltage is determined by generator speed (constant) and excitation. Excitation is controlled by an automatic voltage regulator, a field rheostat or both. Generator terminal voltage is ideally a constant, when carrying a steady load which does not exceed its kva rating, due to the action of the voltage regulator.

Connected Load

Kw rating of the alternator (and hp rating of the driver) is determined by the peak continuous load. In an existing installation, average and peak loads may be measured by recording instruments. The 24-hour records for a typical week of operation, including kw and kva or kw and pf, will supply necessary information.

In a projected installation, anticipated load may be estimated from connected load as indicated in Table I Sec. I. For estimating purposes, maximum continuous load for the average industrial plant may be assumed to be 60 to 80% of connected motor load and 90 to 95% of connected lighting load. Duty cycle of static loads must be estimated. For example, electrical heating load may average as high as 80 to 100% of connected load during working hours, as may electrolytic processing loads. Welding loads, however, are usually very intermittent.

Average kw motor load may be estimated on the basis of motor efficiency. For 1800-rpm motors, assume 0.8 efficiency for 2-hp motors and smaller, 0.85 for 3 to 10-hp and 0.9 for 15-hp and larger. Kw input to fully loaded motors may then be calculated from motor rated hp as kw = hp × 0.746/efficiency.

"Initial" load, which exists at the time any motor is started, equals maximum kw (or percent generator rated kw) carried by the system at that time. Initial kva then equals initial kw divided by plant pf. In the average industrial plant, pf usually ranges from 0.70 to 0.90.

Available Capacity

Available alternator capacity is that portion of the alternator kva which may be effective in starting additional motors (representing a

TABLE 1—Connected Load Characteristics

I. Amplitude of Connected Load (specify each subtotal A to E)

A. 110-volt lighting—kw and percent unbalance
B. Static Loads (including heating, welding, electrolytic)—total kw, single or 3-phase, hours per day in service
C. Induction Motors (list squirrel cage and slip ring separately)—total hp, subtotal hp over 50 hp, 15-50 hp, 3-10 hp, under 3 hp.
D. Single-Phase Motors (list capacitor start, split phase, repulsion-induction separately)—total hp, subtotal over 5 hp, 1-3 hp, under 1 hp
E. Synchronous Motors—identify each by hp, rpm, power factor.

II. Amplitude of Fluctuating Load (Identify A and B)

A. Larger* Polyphase Motors, identify each as follows:
   1. Describe Application—motor rating, type of motor and load, number of identical units.
   2. Classify motor starting cycle—frequent or cyclical, infrequent or occasional, once a day before working day begins.
B. Pulsating or reciprocating loads—identify each by: working strokes per minute, motor hp, motor starting cycle (see above)

* Larger motor hp ratings are those at least 20% of largest motor hp rating.

III. Maximum Allowable Voltage Variation (Identify A and B)

A. Classify Lighting Quality Requirements.
   1. Light flicker not permitted in plant or office at any time; or
   2. Light flicker not permitted during certain hours (specify); or
   3. Lighting quality not a factor; maximum voltage variation of 25% is acceptable during working day.
B. Classify Initial Load Requirements
   1. Starting sequence and starting time of each motor is random and unpredictable; or
   2. Largest motor always started before working day begins with 10% or less initial load (no motors) and runs all day; remaining motors start at random; or
   3. Larger* motors, which are identified above as starting once a day, each use preselected† starting sequence; remaining motors start at random.

† Preselected starting sequence requires 1st motor (usually largest motor) to start before working day begins and with 10% or less initial load including only static (no motor) loads. Other large motors which start before working day begins are scheduled in order of decreasing hp. Each motor in preselected starting sequence runs continually through day.

very low pf load). Unused capacity is the numerical difference between alternator rated kva and initial load kva, when generator pf is approximately equal to pf of initial load. Kva available alternator capacity, measured as a percent of unused alternator capacity, may be calculated from Table 3.

For example, a generator rated 100-kw, 125-kva 0.80 power factor is half loaded when carrying an initial load of 50 kw, 62½ kva, at 0.80 power factor. Its unused capacity is therefore 62½ kva. Alternator capacity "available" for additional load also equals 62½ kva, provided power factor of additional load is 0.80 or higher. On the other hand, if the 62½ kva unused generator capacity is applied as starting kva to a squirrel-cage induction motor, less than 62½ kva may be described as "available" for this purpose. Due to the very low power factor (about 40%) of the induction motor at the instant it is first connected to the power supply, only 50 kva (62.5 x 0.8) is available for full voltage motor starting, as indicated in Table 3.

Starting an electric motor on full voltage results in a load current six to eight times motor rated full load current. The combination of high starting current and low starting

TABLE 2—Starter Factors

Available alternator kva capacity (see Table 3) must equal or exceed product of starter factor and hp rating of polyphase motor which may be started with less than 25% voltage variation*. Load torque must not exceed motor starting torque developed on first step of starting (see Table 4).

Motor Description		Starter Descriptions					
		Across	Compensator			Pri. Resistance	
Type and Design	RPM Speed	the line	0.80 Tap	0.65 Tap	0.50 Tap	0.80 Tap	0.65 Tap
		Starter Factors kva/hp					
Squirrel Cage	1800	5.2	3.4	2.3	1.5	4.2	3.4
Designs	1200	5.0	3.3	2.2	1.4	4.0	3.3
B and C	900	4.9	3.2	2.2	1.4	3.9	3.2
Design D Punch Press	1800 or 1200	4.5	3.0	2.0	1.3	3.6	2.9
Elevator	ditto	4.0	....	....	....	....	....
Synchronous							
High Speed Motors		5.6	3.8	2.5	1.6	4.5	3.7
Low Speed Motors		3.4	2.2	1.5	1.0	2.7	2.2

	Starter Factors—kva/hp	Type of Starter
Slip Ring		
Low Starting-Torque Load	1.35	Standard across-the-line starter for stator, with controlled resistance in the rotor circuit.
Medium Starting-Torque Load	2.0	
High Starting-Torque Load	2.6	

* For 5% voltage variation, use not more than 20% of available alternator capacity. For 40% voltage variation, with 10% initial load on alternator, use not more than 160% of available alternator capacity.

power factor may cause considerable disturbance to the generator terminal voltage in a limited-capacity system.

Voltage Variation

Maximum acceptable voltage variation which occurs during motor starting varies widely in different applications, depending on characteristics of the initial load. For example, an initial lighting load may require minimum voltage variation to maintain lighting quality. Or instantaneous voltage requirements of other motors connected to the system may be the limiting consideration.

Industrial standards of maximum accepted voltage variation, expressed in percent rated voltage, include: 5% variation, where initial lighting quality must be maintained; 25% reduction to prevent drop-out of low voltage relays used on initial motor loads; and 40%, where little or no initial load exists and only minimum acceleration torque requirements of added load need be considered.

Causes of Voltage Drop

Transient or continuous loads in excess of alternator kva rating will cause a drop in alternator terminal voltage. Even with constant generator voltage, IR drop in the distribution system can cause voltage reduction at load.

Disregarding overload and distribution losses, and considering loads which do not exceed kva rating of system, a reduction in generator terminal voltage may result from a very low load power factor or a high rate of load application. Low load power factor will reduce "available" capacity far below alternator rating. A high rate of load application may exceed the response rate of the automatic voltage regulator, exciter, and generator field circuit.

In applications allowing a 25% voltage drop at the instant of motor starting, voltage regulator response will bring terminal voltage back to rated voltage during acceleration of the motor. With full voltage or reduced voltage 2-step starting, voltage will thus return to normal provided: (1) the available capacity of the alternator is more than 60% of the alternator kva rating, and (2) the motor-starter kva requirement is less than 30% of the available alternator kva.

Under the same conditions, if only 5% voltage drop is to be allowed, response of the voltage regulator will be of no assistance. Only about 20% (5/25) of alternator capacity which would have been available for 25% voltage drop may be used, as indicated in Table 2 footnote. Inherent characteristics of alternators described in Tables 2 to 4, will allow 40% voltage drop between no load and full kva load. Action of the voltage regulator is largely responsible for voltage maintenance.

Light Flicker Limitation

A specification of "no light flicker" is usually considered equivalent to 5% limitation on voltage variation which occurs during motor starting, provided motors start at non periodic intervals. If motor starting is cyclic, as in an automatic machine requiring one start per second, a 2 to 3% voltage variation will cause objectionable light flicker.

Reducing voltage fluctuation to less than 5% solely by selection of motor types and starter designs from Table 2 will, at best, result in a very high cost in rated alternator kva per motor horsepower. For example a 10-hp, 1800-rpm squirrel cage Design B induction motor started with an 0.80 tap autotransformer will require 34 kva (10 x 3.4) available alternator capacity and 49 kva unused capacity for 25% maximum voltage variation. With 5% maximum voltage variation, the same motor-starter combination will require 170 kva available capacity, or five times that for 25% variation.

To minimize alternator capacity required for 5% voltage drop limitation, an increment-start, multiple-step primary resistance starter of special design may be used. If resistors for each step are properly selected, an additional load equal to 20% of available kva alternator capacity will be required for each step. This results in 5% voltage drop per step of motor starter. With the steps timed one to two seconds apart, the alternator voltage will increase after each step. By this means it is possible to start motors within 5% voltage limitation, without exceeding the alternator capacity which would have been required for 25% maximum voltage variation.

Primary resistance increment starting for 5% voltage limit is used only where kva of initial load represents not more than 25% alternator rated kva capacity. It should not be confused with 2-step primary resistor starting, listed in the right of Table 2, which requires load acceleration on first step. For economic reasons, increment starting is usually manual.

It is often practical to limit number and size of motors which are allowed to start and stop during parts of the day in which quality of lighting is most critical. By this means alternator kva required per motor hp may be further reduced.

If larger motors are started just prior to the beginning of work and operated until shut down, two bene-

TABLE 3—Alternator Capacity Ratio

Available† alternator capacity in kva divided by kva unused* capacity equals alternator capacity ratio. Applies only to 0.8 power factor alternators carrying initial loads with power factor 0.8 to unity which do not exceed 75% alternator kva rating.

Type of Motor and Starter	Alternator Capacity Ratio
Squirrel Cage and Synchronous	
Full Voltage and Compensator Starter	0.80
Primary Resis. Starter 0.80 tap	0.85
0.65 tap	0.90
Slip Ring Motor with Secondary Control	
Light Starting Duty	1.00
Medium Starting Duty	0.90
Heavy Starting Duty	0.85

† Available alternator capacity is the kva effective in accelerating industrial motors as described in Table 2.

* Unused alternator capacity equals alternator kva rating minus existing or initial load on alternator.

fits are realized: 1) initial load is minimum, and unused alternator kva is maximum when motors are started; and 2) maximum voltage variation of 25% may be allowed during their starting.

Use of clutches to disconnect and reconnect motors to load will permit motors to operate continually and loads to be cycled independently of the motor. Similarly, use of a separate motor-generator set will permit independent load cycling. Addition of a flywheel to the MG set will also reduce line voltage variation as load is cycled. Either method reduces the number of times the main generator must supply starting kva during the day.

Pulsating peak load, caused by reciprocating equipment, may cause voltage dips which have a frequency of up to 10 cps. Variation at 10 cps may cause objectionable light flicker with as little as 1% voltage variation. Increasing alternator kva capacity to reduce such variation may prove too expensive since this fluctuation is too rapid for the voltage regulator to follow.

To reduce flicker, pulsating loads may be isolated from lighting. Also a separate lighting feeder will eliminate that part of flicker which originates as pulsating IR drop in feeders carrying pulsating current. In extreme cases, a separate power supply or a fly wheel m-g set may be required for such circuits to eliminate pulsations from the supply. Both methods are shown in Fig. 2. Addition of a heavier fly wheel to the mechanical load will be beneficial in reducing pulsations in the case of a punch press, plunger pump or similar load.

Starting Large Motors

In instances where light flicker is no problem and initial load contains no other motors, a large voltage drop during motor starting may be allowed. The largest motor hp which may be started will be determined by initial load, type of motor and starter, alternator rating and load starting torque.

In isolated pumping stations or other applications requiring low starting torque, the entire output of an alternator is sometimes used to start and operate a single motor. To minimize alternator kva per motor hp, it may be possible to: 1) accelerate engine, alternator, and motor together; or 2) reduce alternator voltage by field control and accelerate the motor as alternator voltage builds up. In either case starting kva/hp (Table 2) for across-the-line starting must not exceed 200% available capacity. Prior approval must be obtained from manufacturers of motor and generating set.

In industrial applications, 40% voltage variation is maximum permitted even when starting a motor with initial load of less than 10% capacity. Starting kva per hp in Table 2 multiplied by motor rated hp must not exceed 160% of available alternator capacity. Using an across-the-line starter, motor torque at the instant of start will be 36% of rated locked rotor torque (Table 4). Starting kva of the next motor started should not exceed alternator available capacity. In other words for a specified alternator rating, an allowable voltage variation of 40%, with 10% or less initial load, will permit a single motor to be started of almost double the hp recommended for 25% drop.

In preselected starting, the largest motor in the plant is started before any lighting load or initial motor load. The remaining large motors are started in order of decreasing hp, with 25% maximum voltage variation (Table 1, IIB). Only those motors which must cycle during the day are thus subject to a possible 5% limitation on voltage variation. Preselected starting thus reduces alternator kva rating for average industrial load, compared to kva for random starting.

Alternator Selection

Selection of kva and kw of a generator to provide primary source of power in an isolated industrial application must be based on information outlined in Table 1. This table is used as a guide in securing sufficient load information for the manufacturer of the generating set.

Tables 1 to 4 are useful in estimating approximate size and cost of various proposed alternate methods of load distribution, types of motors, types of starters, etc. For example, use of slip-ring motors will minimize required alternator kva, but may add more to overall cost of the installation than the saving in alternator cost. The tables are also useful in selecting motor and starter types where an addition of load on an existing generating set is under consideration.

For example, assume an existing 100-kva, 0.80 pf, 80-kw alternator carries a load including 20 kw total balanced lighting and small motor load with a power factor of 0.8,

TABLE 4—Reduction in Motor Starting Torque on Limited Capacity System

Type of Starter	Max. Voltage Drop at Starter Terminals			
	None	5%	25%	40%
	Percent of Rated Locked Rotor Torque Developed by Motor at Start			
Across-the-line	100	90	56	36
2 Step Compensator or Primary Resistor				
0.80 tap	64	58	36	23
0.65 tap	42	38	24	15
0.50 tap	25	23	14	9

plus several larger motors carrying full load. The larger motors include one 15-hp motor with 80% tap compensator starter and four motors, rated 5 hp each, using full-voltage starters. Assume the 35 hp in large motors is to be increased to 45 hp by substituting one 25-hp and two 10-hp 1800-rpm, Design B or C induction motors. Maximum voltage variation is to be maintained at 25%.

Since no indication is available as to which motor starts first, the most difficult condition is assumed. Greatest kva load occurs when the 25-hp motor is started on an initial load of 20 kw plus two 10-hp motors running at full load. Two 10-hp motors with 0.85 efficiency, represent 17.6 kw (20 x 0.746/0.85) or 22 kva (17.6/0.8) at 0.8 power factor. The initial 47 kva (25 + 22)

(*Continued on Page 235*)

MODERN KITCHENS of this type are being designed into new apartment houses throughout the New York metropolitan area. Kitchen here is in a cooperative apartment house development in the suburbs. The kitchen has: a 10 cu ft refrigerator and a 6 cu ft freezer—each with a separate door; an electric counter-top range; under-counter dishwasher; and a built-in double electric oven. All rooms except bathrooms are provided with air conditioning sleeves under the windows. Two unit air conditioners are supplied for each apartment. Circuit capacity in each apartment panelboard matches these and other loads with circuits and outlets to spare.

NYC utility suggests standards for . . . .

Load Centers for Modern Apartments

By J. F. McPartland

ELECTRICAL DATA ON NEW CONSTRUCTION OF APARTMENT HOUSES

From January Through September, 1958

		Number of buildings	Number of apartments	Percent of apartments
Construction planned		153	17,909	
Wiring	2-wire distribution	10	745	4.1
	3-wire distribution	143	17,164	95.9
Dishwashers	Units installed in apartments		6,328	35.3
	Provisions made (electrical & plumbing)		5,063	28.3
	Total		11,391	63.5
Refrigerators — 10 cubic feet or over			12,543	70.0
Electric ranges — installed			243	1.1
Auxiliary lighting			165	0.9
Bathroom heaters (units installed)			3,125	17.4
Air conditioners	Wall units installed in sleeves under windows		14,540	81.2
	Sleeves only installed in bldg. wall		1,462	8.2
	Wiring only provided for units		1,853	11.3
	Central systems		54	0.3

NOTE: The data given here was developed by the Apartment House Sales Bureau of Con Edison, covering the area served by the utility. The total of 153 buildings represents the number of apartment houses on which plans have been filed—excluding public housing and institutional housing projects.

ELECTRICAL LOAD GROWTH in apartment houses is indicated in this table which suggests the need for full capacity load centers with special appliance circuits, separate lighting and receptacle circuits and spare circuits for inevitable load additions in the way of appliances.

IN A RECENT circular mailed to electric power users in New York City, Consolidated Edison, the electric utility company, spotlighted a practical design approach to wiring individual apartments. The presentation promoted real adequacy in electric supply to each apartment and stressed separate-circuit operation of modern appliances.

The trend toward electrical living has become a landslide in apartment living. Apartment dwellers are buying the variety of appliances which in the past were widely used only in individual residences. These include: electric washers and dryers, large refrigerators and freezers, air conditioners, ventilating fans, dishwashers and the full range of portable kitchen and dining area appliances. It is important, therefore, that this be taken into account in electrical design for new apartment buildings and in modernization of old ones.

To promote and organize modern design for wiring in new apartment houses, Con Edison has set up

an Apartment House Sales Bureau, under the direction of Bill Stecker. The Bureau is currently engaged in an extensive campaign to boost the use of kitchen and laundry electrical appliances. This is based on a study they made to determine just what today's apartment housewife wants in her kitchen. From interviews with 1531 housewives living in apartment houses in the metropolitan N. Y. area, the following information was developed:

1. Kitchens are too small. The average was 78.1 sq ft (7 ft 4 in. by 10 ft 8 in.).

2. There is general dissatisfaction with the amount of counter space, wall cabinets and undercounter cabinets.

3. Demand for better kitchen lighting is widespread. Average level of all apartments was 10 footcandles. In nearly all kitchens, the sole source of light was a 100-watt bulb in a ceiling fixture. Demand was high for lighting over ranges and sinks. The IES recommendation for range, sink and counter areas is 40 fc.

4. The average refrigerator was 7 cu ft. The demand was for about 9 cu ft. Nearly everyone wanted a freezer compartment in the refrigerator. A third of the total interviewed want a separate electric freezer.

5. Two-thirds of those interviewed want more kitchen appliance outlets. Only half of the apartments have outlets above counter space. And then, it was a single duplex receptacle. Most apartments have another duplex receptacle, but it usually is in constant use for the refrigerator and an electric clock. A high saturation of appliances pointed up the serious need for more appliance circuit outlets.

6. Nearly every kitchen had a refrigerator, electric iron, toaster, clock and radio.

7. Two-thirds of the kitchens had some type of electric broiler or rotisserie.

8. Demand for kitchen exhaust fans was almost unanimous.

9. About 50% of the kitchens had or wanted electric mixers and automatic coffee makers.

10. The blender, the frypan, the roaster and the egg cooker were used in less than 10% of the kitchens.

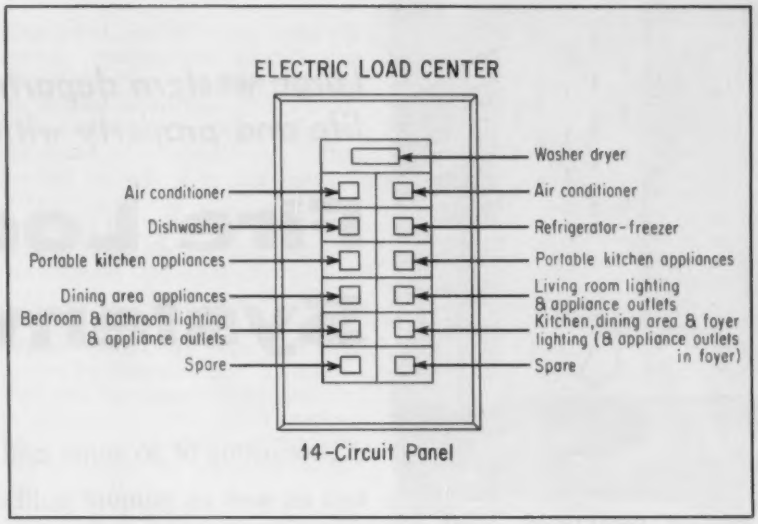
11. More than 99% had gas ranges, but a third would prefer an electric range. From discussion of gas vs electric ranges, operating cost was relatively unimportant to the users.

12. In a separate survey covering 406 apartments with electric ranges, 90% of the users prefer electric to gas.

13. Over 80% of users use all four range burners simultaneously.

14. More than 40% of those interviewed want electric dishwashers. About 25% would pay a rent increase for one.

15. Only 17% of the housewives had clothes washers in their apartments. Over 40%, however, would like to have automatic units in their apartments. And the demand for combination washer-dryers is even greater. These tenants are ready and willing to pay rent increases if the landlords would install machines for them.



FULL UTILIZATION of modern electrical appliances is assured by use of a load center panelboard located in a convenient place in the apartment and supplied by a minimum of three No. 6's.

To meet the growing demand for electrical energy, the basic design approach must provide convenience, flexibility, safety and capacity. The first step in arriving at an adequate system is clear recognition of the size and nature of loads to be served.

Much of the confusion and dissatisfaction involved in electrical design for residential occupancies derives from insufficient attention to load conditions. Purely mechanical and arbitrary service calculations and circuit layout only vaguely related to the probable load conditions is not sound electrical design. And neither is the abstract promotion of "100-amp service" for "everybody and his brother." The answer to today's electrical inadequacies lies in modern design—recognize the loads, circuit the loads, then service the circuits. But the big point is "circuit the loads" and then the service size will be no problem.

Based on their survey of loads, Con Edison is recommending the use of modern load-center panelboards with an individual circuit for each heavy appliance, at least two circuits for portable appliances in the kitchen and dining area, a circuit for living room lighting and convenience receptacles, one or more circuits for other lighting and receptacles and at least one spare circuit. And the feeder to each such panelboard must be a 3-wire, single-phase 120/240-volt circuit of No. 8's or 6's—or larger if necessary.

These recommendations establish only the average approach and do not purport to make detailed engineering unnecessary for a specific system. Each installation must be calculated. There are no magic formulas which make design automatic. But electrical utilization will seem like magic to the apartment dweller if the designer puts proper emphasis on "designing for *load*" instead of "*loading* the design."

Accompanying illustrations cover highlights of the wiring campaign.

SPOKANE DEPARTMENT STORE has 36-zone fire detection and alarm system to protect nine floors above ground plus three basement levels. In case of emergency, interior bells and buzzers warn key personnel and telephone operators of potential danger, while exterior vibrating bells summon aid from fire station located directly across street from this large commercial structure.

Large western department store protects life and property with low-voltage . . .

Fire Locator System

. . . consisting of 36 zones and combining automatic detectors as well as manual pullbox stations, both ac and dc power supplies, an area-designating annunciator, and visual and audible warning devices.

THE Bon Marche department store in Spokane, Wash., occupying over half of a city block and consisting of 11 floors above ground plus two basement levels, has installed an extensive 36-zone fire detection and alarm system that is noteworthy due to its emphasis upon "double insurance."

For example, the store is equipped with 150 automatic detection devices that operate on the double principle of rate-of-rise as well as a fixed temperature limit of 136° F. Warning signals can be initiated either by these automatic detectors or from manually operated pull-box stations located at all entrances and exits on all floors.

Continuity of power is also doubly insured by backing up normal ac utility service by auxiliary wet-cell dc batteries. The exact location of a fire is indicated *visually* on a central illuminated annunciator panel installed in the first-floor lobby, which is never locked. And additional *audible* signals consist of (1) interior vibrating-bell unit to signal key store personnel, (2) exterior 10-in. bells that summon aid from a city fire station located directly across the street, and (3) a buzzer located at the telephone switchboard to inform operators of the emergency. Operators, in turn, would then use the "all floor" paging system to alert other store personnel and shoppers.

HEAT-DETECTION DEVICES mounted on ceilings are activated if temperature in area reaches 136 degrees or if temperature rate-of-rise exceeds prescribed limit. Alarm may be initiated either by these automatic devices or from manual pull-box stations located at all entrances and exits on all floors.

Basic control is centralized in three large sheet-steel surface-mounted panels installed in the sub-basement of the store. Each panel, with its hinged door normally locked, contains wiring terminal strips, contacts and relays related to stations on four floors, each floor being divided into three zones and each zone containing an average of four automatic detection stations plus two manual pull-box stations.

Main power supply for the control center is provided through a group of separately mounted 100-watt transformers connected to the store's 60-cycle, 120-volt utility emergency service, while secondary standby power is available through a series of adjacently placed wet-cell batteries capable of operating

CEILING-MOUNTED DETECTORS are connected in parallel by means of 2-conductor thermoplastic-jacketed cable, loop lengths being limited so as to keep maximum resistance below 15 ohms. Total installation includes 150 of these units, divided into three zones per floor with an average of 4 detectors protecting each zone.

the supervisory system for 24 hours and alarm bells for 15 minutes in event of a primary power failure.

Alarm bells, mounted both inside and outside the building, are 20-volt dc units while trouble bells, mounted adjacent to control panels to attract the attention of maintenance personnel, are 24-volt units. After a maintenance man answers the call of the trouble bell, he may silence it by means of a single-pole switch mounted beneath one of the control panels.

The previously mentioned annunciator, remotely located inside the building's main entrance on the street floor, contains 36 pilot lamps that remain illuminated under normal conditions. Upon operation of any detector or manual pull-box station, however, the lamp related to that zone of trouble will be extinguished, and all alarm bells will sound continuously until the trouble station has been restored to normal conditions and the affected pilot lamp has been relighted by means of a related reset button located beneath it on the annunciator panel.

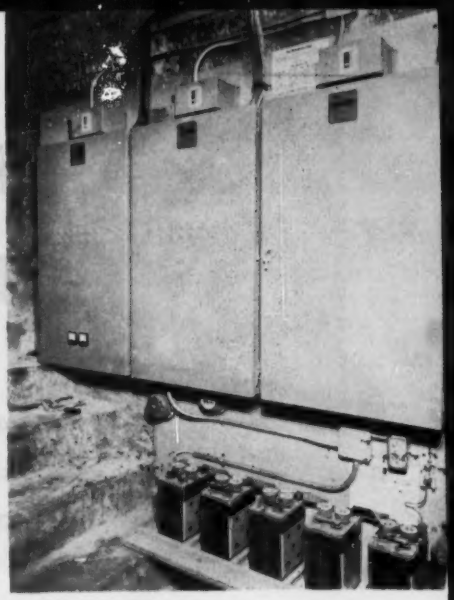
Should the main power supply be interrupted, the system will be transferred automatically to battery operation, and trouble bells in the sub-basement and in the telephone switchboard room will summon a maintenance man. This same bell will also sound in the event of a wiring fault, and it will continue to sound until the fault has been corrected or the silencing switch has been thrown.

Wiring of alarm and trouble bells is with No. 12 rubber-covered wire in conduit, while 2-conductor surface-mounted circuiting related to detectors and manual stations is heavy-duty 16-gauge flat rubber-insulated wire, each circuit loop being limited to a maximum resistance of 15 ohms.

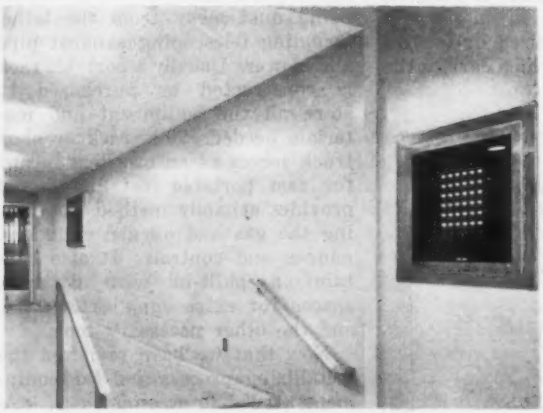
Although the principle of automatic low-voltage detection and alarm has been utilized previously in smaller buildings and in geographical locations where utility service is not dependable, this installation in Spokane represents a marked expansion in extent of zoning, variety of features and in the gross area served.

Meeting all requirements of NFPA pamphlet No. 72, the Pacific Rating Bureau, the N. Y. Multiple Dwelling Law and listed by UL, the system goes by the name of AMVAD, those letters designating that it is an automatic manual vibrating bell ac-dc fire-locator system.

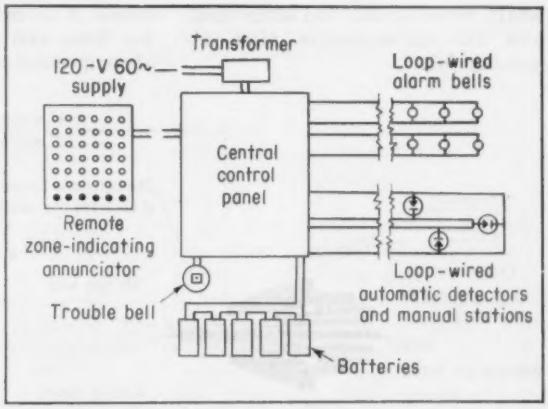
Planned by architect John Graham with Edwards-designed components, the system was installed by the Power City Electric Inc., Spokane, under the supervision of that organization's electrical engineer C. E. Rorberg and job superintendent W. L. Morrow.



CONTROL PANELS located in sub-basement contain terminal contact strips, relays and wiring related to this supervising and alarm system. Trouble bell beneath panels summons maintenance man in event of action by detector or pull-box station, power interruption or wiring defect. Auxiliary battery in addition to main 60-cycle power provides insurance against total interruption of a supply current.



ILLUMINATED ANNUNCIATOR located conveniently and centrally in lobby contains 36 normally lighted pilot lights. Upon operation of any manual pull-box or automatic detector, however, lamp related to the zone in trouble will be extinguished and all alarm bells inside and outside the building will sound continuously until normal conditions are restored.



BASIC WIRING DIAGRAM shows schematic hook-up of components forming this protective system. Alarm and trouble bells are wired with No. 12 wire in conduit; transformers and batteries are connected to control panels by means of No. 14 wires, while loops related to manual stations and detectors are No. 16 2-conductor rubber-insulated cables.

Metallizing Rotor Shafts

A process whereby the repairing of worn and damaged rotor shafts to fit standard bearings is accomplished fast, efficiently and economically.

METALLIZING damaged rotor shafts is but one of the many motor-related non-electrical tasks performed by the Franklin Electric Company motor repair shop in Evansville, Ind. They have found that by employing the metallizing process in their repair work they have been able to make faster and more efficient repairs to worn or damaged shafts and bearing surfaces, and at less cost to their customers.

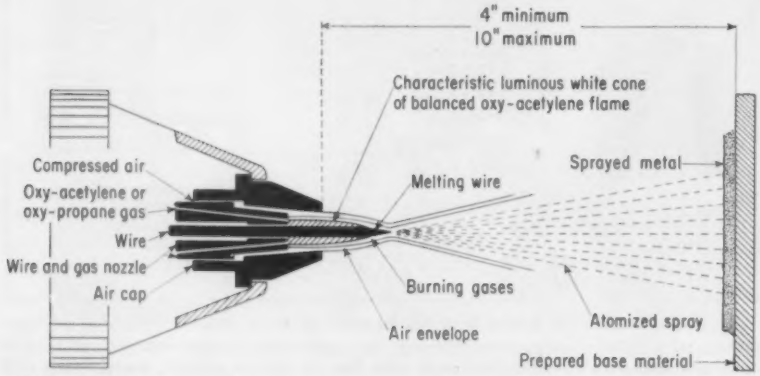
In most shops, when a motor with a damaged shaft is brought in for repairs, it either has to be sent to an outside machine shop, or turned-down on a lathe in the shop until all damaged or worn areas are removed. When this is done a new bearing has to be made to fit the smaller turned-down shaft, which could, and often does, run into an expensive, time-consuming job.

Metallizing tackles the job another way. Basically, this is how it works and the equipment that is needed:

(A) HOW IT WORKS—First of all, the surface to be metallized is prepared mechanically by undercutting the damaged area, roughing it up with a knurling tool and spraying it with Sprabond wire, a high molybdenum alloy which will bond to clean iron or steel surfaces. This provides an excellent preparation coat to which the sprayed metal will in turn bond securely and build up to the desired thickness. This coating paves the way for the actual metallizing or metal spraying which is a process whereby any metal, in wire form, is automatically drawn through a special "gun" to a nozzle, where it is melted in an oxygen-gas flame and atomized by a blast of compressed air which carries the metal particles to the previously prepared surface. The particles or "flakes" mesh or are driven on to the surface to produce a coating of the desired metal. Since the air blast also acts to keep the sprayed surface cool, metallizing is known as a "cold" process of building up metal—free from risk of warpage or distortion.

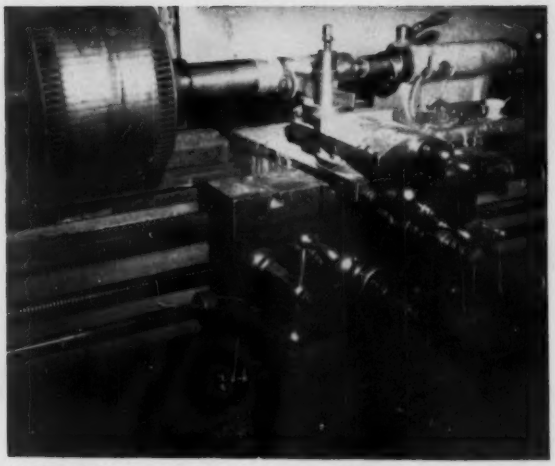
(B) EQUIPMENT NEEDED—A metallizing gun weighing about five pounds (about the size of ½ inch electric drill) should be large enough for most shops and it may be hand held or mounted in the lathe tool post. Acetylene, oxygen and compressed air, plus a lathe and a few other tools generally considered as standard shop equipment are also needed, plus a lathe exhaust hood unit to carry metallizing dust away from the lathe, including telescoping exhaust pipe and blower. Usually a portable rack is constructed or purchased to store all the equipment and materials needed. This rack or shop truck serves as an excellent means for fast portable metallizing and provides a handy method for storing the gas and oxygen cylinders, gauges and controls. It also contains a built-in wire dereeler, spaces for extra supplies of wire, and the other necessary tools.

Now that we have reviewed the metallizing process and the equipment needed to accomplish it, let's take a look at how the process was applied step-by-step to repair the damaged area of a 40 hp rotor shaft that Franklin Electric recently overhauled in its shop.



CROSS SECTION of metallizing gun's nozzle shows how metal wire is melted by burning gasses and driven onto prepared surface by air blasts.

UNDERCUTTING the shaft is done with a cutting die placed in the lathe tool post. This is necessary to clean and cut away the damaged areas and expose the base metal.



KNURLING the undercut area or roughing it up is done to provide a bond strength almost equal to that of the sprayed metal itself.

BONDING AGENT called Sprabond wire is sprayed on to the prepared surface by a mixture of oxygen, acetylene and air all under pressure, the same as the metallizing process. The high molybdenum alloy content of the wire furnishes an excellent bonding surface for metallizing.

METALLIZING SHAFT is accomplished by drawing metal through a special "gun" to a nozzle where it is melted in an oxygen-gas flame and atomized by a blast of compressed air which carries the metal particles to the prepared surface to produce a coating of the desired metal.

Step No. 1

The rotor with attached shaft was placed in an old engine lathe and rotated at a medium-slow rate of speed. After the area to be processed was freed of all dirt and grime, a cutting die was placed in the tool post of the lathe to undercut the shaft until the damaged area was cut away and the base metal exposed.

Step No. 2

The undercut area was knurled or roughed-up by use of a rotary preparation tool or as it is commonly called "knurling tool". This operation is done to provide a bond strength almost equal to that of the sprayed metal itself, and is now accepted as a standard shop practice.

Step No. 3

A bonding agent was sprayed onto the prepared surface about two or three thousandths of an inch thick. This special bonding agent is called Sprabond wire which is fed through the nozzle of the spray gun and is applied with a mixture of oxygen acetylene and air all under pressure the same as the final metallizing process. The Sprabond wire is made up of a high molybdenum alloy which bonds well to clean iron or steel surfaces and in turn provides an excellent preparation coat to which the final sprayed metal will bond securely and build up to the desired thickness.

Step No. 4

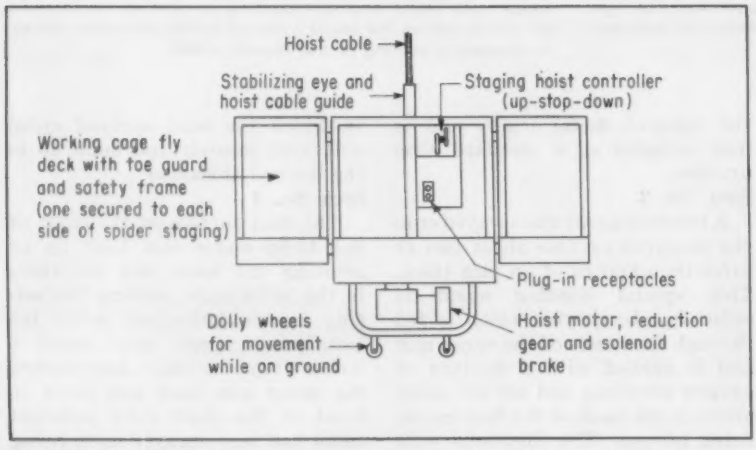
The final surface of the shaft of the 40-hp motor was built up by rotating the rotor and the shaft in the lathe while holding (or setting in the lathe tool post) the metallizing spray gun about 6 inches from the shaft and moving the spray gun back and forth in front of the shaft until sufficient metal had been sprayed on to bring it back to its original size. In fact, the shaft is always built up a little oversize and then machined down to its original finished size.

CONTROL TOWER for New York's International Airport is 185 feet high, has 650 windows, and is permanently sealed against dirt and noise. It can be cleaned only from the outside, such as from electrically powered and controlled mobile working stages or 'spiders' that are suspended from monorail trolley beams located along the upper faces of structure.

Exterior maintenance problem solved by . . .

Electric Spiders

Washing outside glass surfaces in sky-scraping 650-window completely sealed structure is facilitated through use of vertical- and horizontal-travelling stage powered and controlled directly from this mobile platform.



DETAILS OF SPIDER shows general construction of central unit and fly decks; position of hoist motor, reduction gear and solenoid brake; arrangement of hoist cable guide and stabilizing eye; location of 3-position controller and castored dolly used to move rig when it is at ground level.

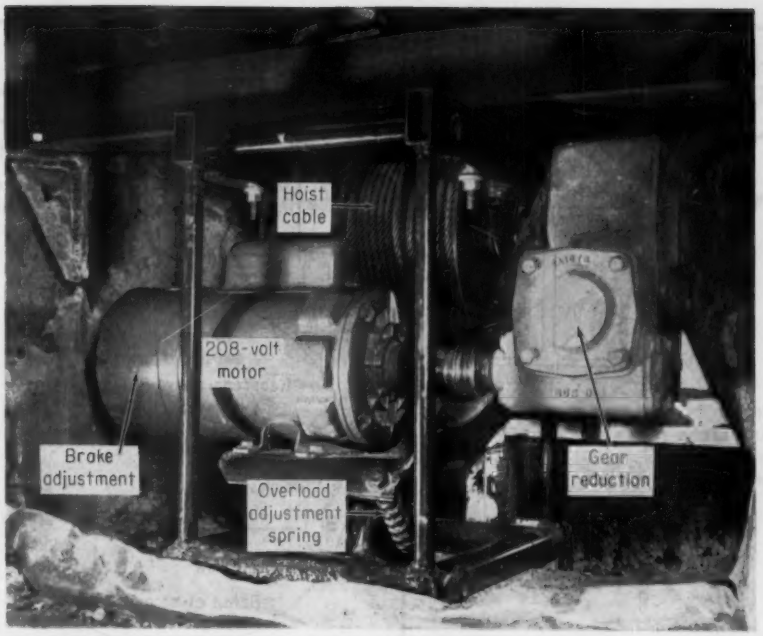
AN ELECTRICALLY powered working platform or "spider staging" that can be moved both vertically and horizontally is an essential "tool" for washing the 650 windows in the control tower at New York's International Airport. In fact, without this movable "spider", the washing chore would be a lengthy and dangerous assignment, inasmuch as the tower (highest such in the world) rises to a height of 185 ft, while all windows are permanently sealed to exclude both dirt and noise. For that reason, window exteriors can only be cleaned from the outside and the design of an easily moved, non-swaying, safe working platform becomes a necessity.

Essentially, the staging consists of a central motorized hoist as-

sembly, two permanently attached working platforms or "fly decks", two wall bumpers of special design, a unique anti-sway mechanism, plus essential control devices. This assembly is suspended, via a hoist cable, from a trolley rigging that rolls along a monorail I-beam mounted across the four sides of the control tower at the 10th-floor level.

In greater detail, motivation for vertical movement is provided by a motorized cable drum, the action of which is controlled (from the staging itself) through a 3-position (up-stop-down) self-centering lever. The motor is a heavy-duty ½-hp repulsion-induction 110-volt single-phase unit with factory-sealed bearings. To facilitate maintenance of brushes, access to the motor is possible by removing a plate in the floor of the staging.

A reduction gear assembly (sealed and operating in an oil bath) is of double-reduction design, providing a total reduction between motor and hoist-cable drum of 192-to-1. Positive braking, sufficient to hold the staging at any vertical elevation at which the motor is de-energized, is obtained through this high gear ratio plus self-locking wormgear features. In operation, the geared-down cable drum rotates at approximately 10 rpm, providing a vertical speed of about 18 ft/min for the staging assembly.



STATIONARY HOISTING equipment, employed to raise staging spider to position where it can be attached to monorail and power cable receptacle, is 208-v unit equipped with overload limit switch, automatic emergency brake, slack line roller and switch as safety features.

Operational Smoothness

At the drive end of the motor rotor shaft, a solenoid brake is attached to promote operating smoothness rather than to provide additional (unnecessary) holding power. The operating circuit of this solenoid brake is incorporated into the power circuit of the hoist motor so that, when the hoist motor is energized in either the Up or Down direction, the solenoid brake coil will likewise be energized and the grip of the brake shoes will be released to permit the motor to drive the gear reduction. Conversely, when the controller handle is released and automatically snaps to the Off position, the power circuits related to both the hoist motor and solenoid brake will be interrupted and the brake shoes will grip the brake wheel to stop motor momentum and possible over-run of the staging.

As an additional safety feature, an automatic mechanical emergency brake is installed on one end of the hoist cable drum as a final protective method for stopping the downward momentum of the staging so that, if there should be a sudden downward acceleration of the hoist cable drum (due to broken shafting or gear-reduction faults), the brake will lock and hold the staging at the vertical position at which the brake is applied.

To open the power circuit to the hoist motor in event of an overload (exceeding 900 lbs), an overload limit switch and regulator are likewise provided. Any load above this permissible limit will activate the limit switch and prevent operation of the staging, although the switch will automatically reset for normal operation when the imposed load is reduced below the 900-lb limit.

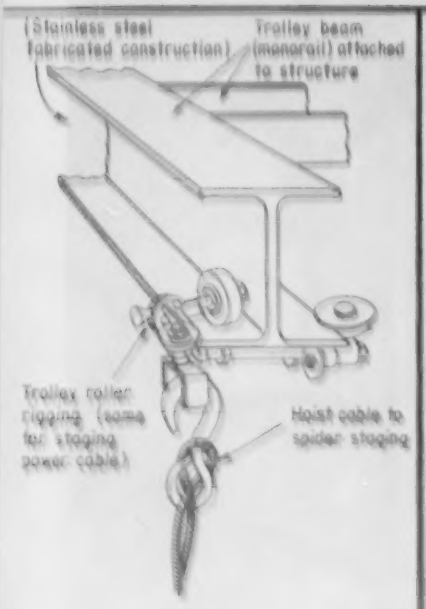
Weatherproof Plug Supplies Power

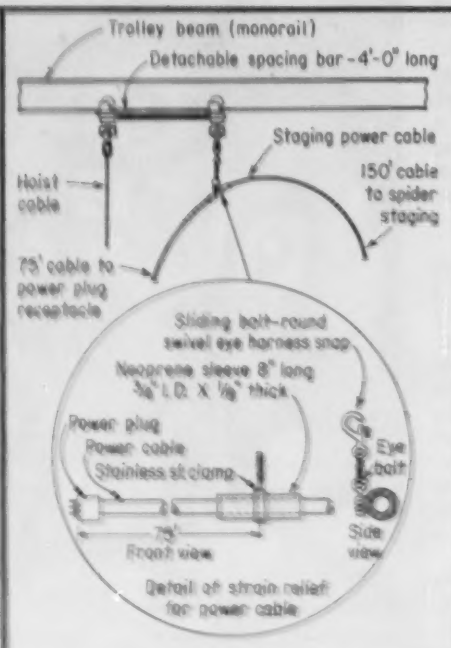
Power for the hoist motor is supplied through a 225-ft 3/c No. 10 stranded 600-volt rubber-insulated neoprene-jacketed cable. One end of this cable is permanently attached to the controller while the other end terminates in a 2-wire 3-pole plug of watertight circuit-breaker safety-arc construction. A threaded screw ring secures the plug into a power receptacle provided on each face of the tower. Also, to lessen strain on the plug and to insure positive lateral movement as the rigging is shifted, the cable is attached (at a point 75 ft from the plug) to a special attachment suspended from the overhead trolley rolling rigging (see sketch).

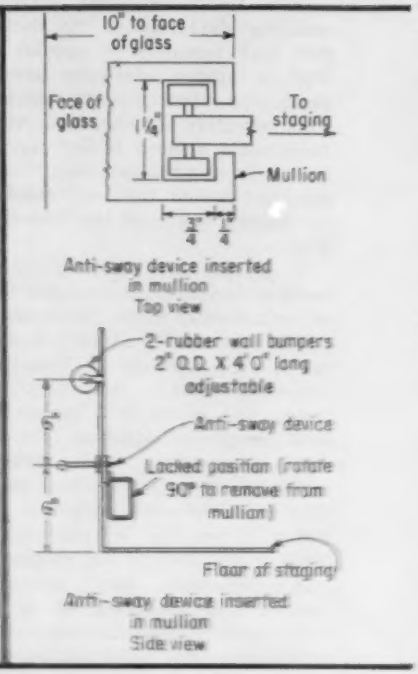
In addition, there is also a weatherproof duplex parallel-slotted grounded power receptacle mounted adjacent to the controller of the spider staging so that 110-volt power becomes available for the possible use of small portable electrical hand tools.

Grounding of the staging is via the third wire and pole of the power circuit, this non-current-carrying medium being connected (at the spider end) to the metal framework of the staging and controller and (at the stationary terminus via the plugs on the faces of the tower) to the grounding system of the tower itself.

As indicated in an accompanying sketch, the rigging consists of two roller assemblies and a 4-ft spacer bar. Rollers are constructed for proper clearances on the monorail







TROLLEY RIGGING consists of two roller assemblies, one of which supports the spider staging by means of an attached hoist cable, while the other supports the power cable extending from the controller of the spider to a receptacle on the outside of the building. Trolley beam is of stainless steel.

SPACING BAR is manually installed between rolling trolleys that support hoist cable and power cable for spider staging. Power cable, supported at a point 75 feet distant from the plug receptacle, is held by neoprene sleeve, steel clamp, twist link, chain and swivelling eye harness snap that attaches to trolley.

ANTI-SWAY DEVICE is inserted in grooved mullion, then is locked by rotating it 90 degrees. Rubber wall platens or bumpers prevent damage to face of tower due to scraping or bumping of staging. Rollers may be adjusted to obtain desired clearance between spider, mullions and surface of windows.

and are not adjustable.

Components of the staging are formed from tubular and plate aluminum alloy to minimize platform weight.

As shown in another sketch, anti-sway provisions consist of a device which is inserted into vertical lipped grooves incorporated in window mullions. This device may be rotated 90 degrees to permit its insertion into, or removal from, the mullion grooves and, in its vertical position, it may be locked to prevent accidental detachment while platform is in use.

To prevent damage (by scraping or bumping) to the sides of the tower, the staging is also provided with two bumpers or platens, each 2 ins. in diameter and 4 ft in length, which are attached to the sides of the fly decks.

Auxiliary Hoisting Equipment

To raise the staging initially to the point where it can be attached to the monorail and power cable receptacles, a stationary hoist is provided, consisting of a second hoisting cable drum driven by an additional electric motor, plus additional hoist cables, anti-sway units, counterweights, brakes, limit switches and related control devices that practically duplicate the functions of all primary equipment already discussed.

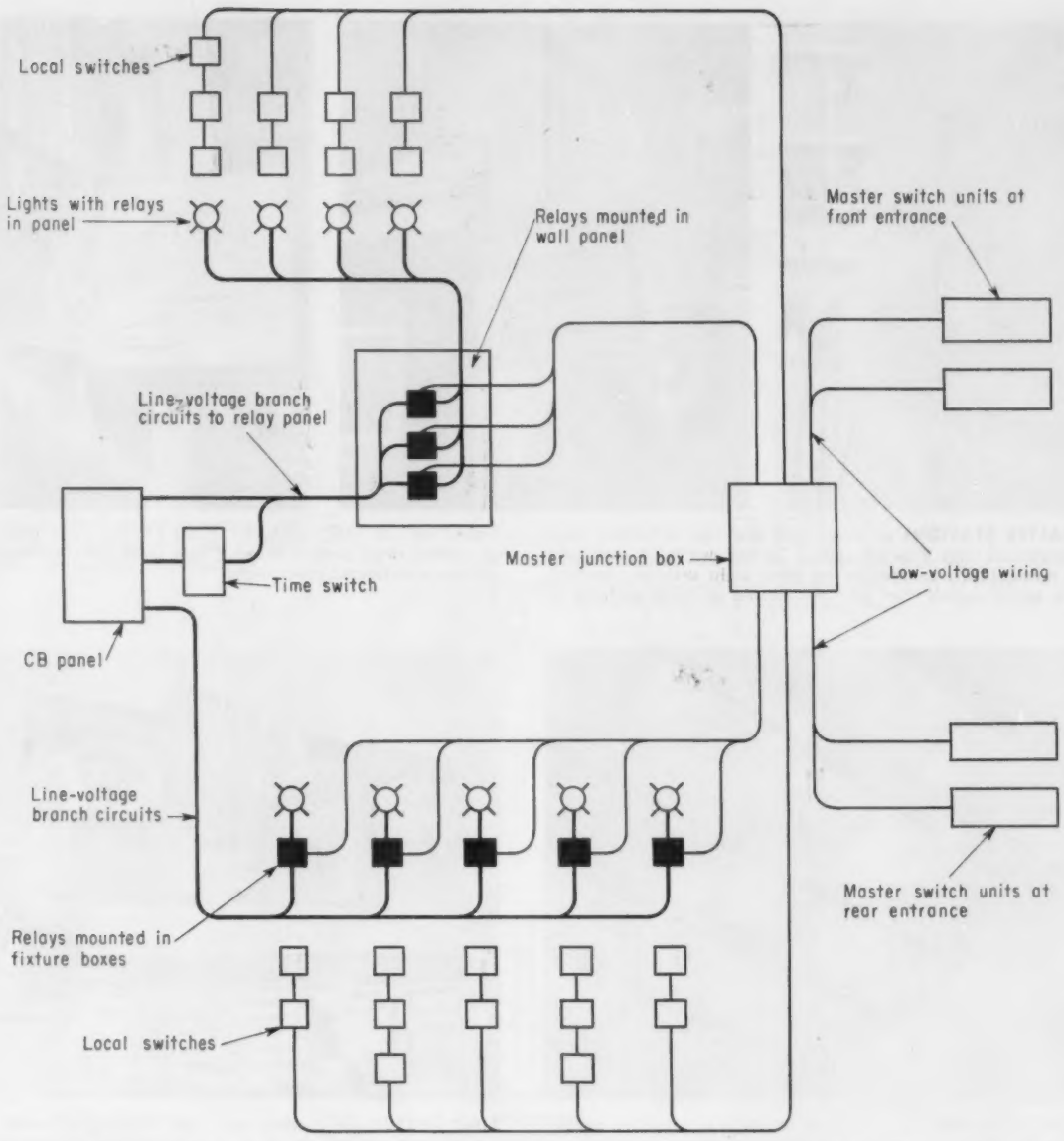
To insure safety of operation, overload limit switches are tested and adjusted (with a 900-lb load) every six months. A slack-line switch on the stationary hoist is tested prior to each window-washing operation. This once-per-washing inspection schedule is likewise maintained for testing hoist limit switches. Automatic brakes are thoroughly inspected twice a year, and hoist cables are carefully examined before each window-washing routine, or every 10 days if the operation exceeds this length of time.

In operation, all components of the spider staging are assembled and checked at ground level, then bumpers are attached and the anti-sway device is positioned in the mullion corresponding to the vertical area to be cleaned. The spider is then raised by means of the stationary hoist, and personnel riding the staging insert the power cable plug into the correct receptacle. When the staging is correctly positioned, the trolley roller rigging is attached to the overhead monorail and the window-washing operation can commence.

This initial auxiliary hoisting procedure is repeated for each face of the building.

Washing order is from the top to the bottom following vertical mullion lines; the stage being progressively raised to the upper limit each time, and the anti-sway device being shifted to the next successive position.

With tall air-conditioned sealed-window buildings increasing in numbers all over the country, this electrically-powered and controlled window-washing stage should prove beneficial in countless instances where access to outer glass surfaces would otherwise be a tedious, dangerous proposition.

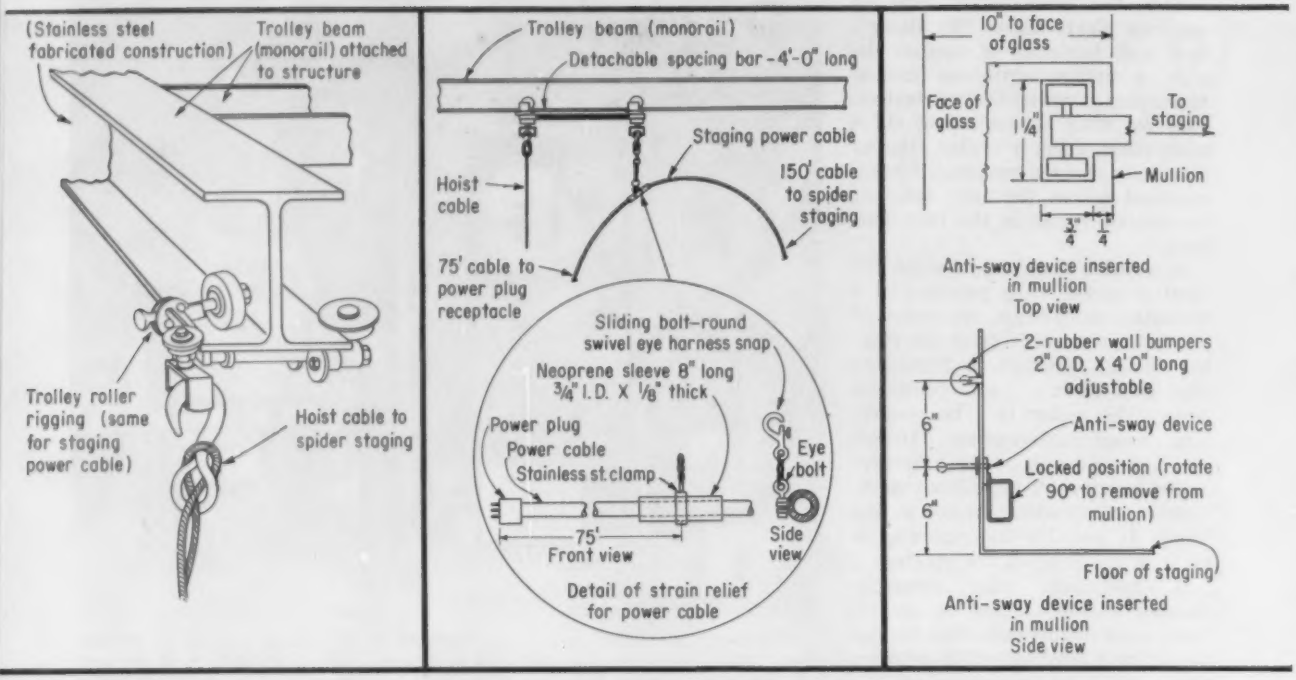


SIMPLIFIED WIRING PLAN shows layout of system components. Heavy lines represent line-voltage wiring in conduit, light lines low-voltage wiring stapled to ceiling joists.

Remote Switching for Small Plant

Apex Signal Services, manufacturers of custom burglar alarm systems, use low-voltage relay switching for control of all lighting circuits.

PILOT-LIGHTED 6-volt momentary-contact switches control all lighting branch circuits in the offices and production area of Apex Signal Services, Hillside, N. J. All rooms have two or three interconnecting doors, and it was felt that relay switching would permit control of room lighting from each entrance without resorting to 3- and



TROLLEY RIGGING consists of two roller assemblies, one of which supports the spider staging by means of an attached hoist cable while the other supports the power cable extending from the controller of the spider to a receptacle on the outside of the building. Trolley beam is of stainless steel.

SPACING BAR is manually installed between rolling trolleys that support hoist cable and power cable for spider staging. Power cable, supported at a point 75 feet distant from the plug receptacle, is help by neoprene sleeve, steel clamp, twist link chain and swivelling eye harness snap that attaches to trolley.

ANTI-SWAY DEVICE is inserted in grooved mullion, then is locked by rotating it 90 degrees. Rubber wall platens or bumpers prevent damage to face of tower due to scraping or bumping of staging. Rollers may be adjusted to obtain desired clearance between spider, mullions and surface of windows.

and are not adjustable.

Components of the staging are formed from tubular and plate aluminum alloy to minimize platform weight.

As shown in another sketch, anti-sway provisions consist of a device which is inserted into vertical lipped grooves incorporated in window mullions. This device may be rotated 90 degrees to permit its insertion into, or removal from, the mullion grooves and, in its vertical position, it may be locked to prevent accidental detachment while platform is in use.

To prevent damage (by scraping or bumping) to the sides of the tower, the staging is also provided with two bumpers or platens, each 2 ins. in diameter and 4 ft in length, which are attached to the sides of the fly decks.

Auxiliary Hoisting Equipment

To raise the staging initially to the point where it can be attached to the monorail and power cable receptacles, a stationary hoist is provided, consisting of a second hoisting cable drum driven by an additional electric motor, plus additional hoist cables, anti-sway units, counterweights, brakes, limit switches and related control devices that practically duplicate the functions of all primary equipment already discussed.

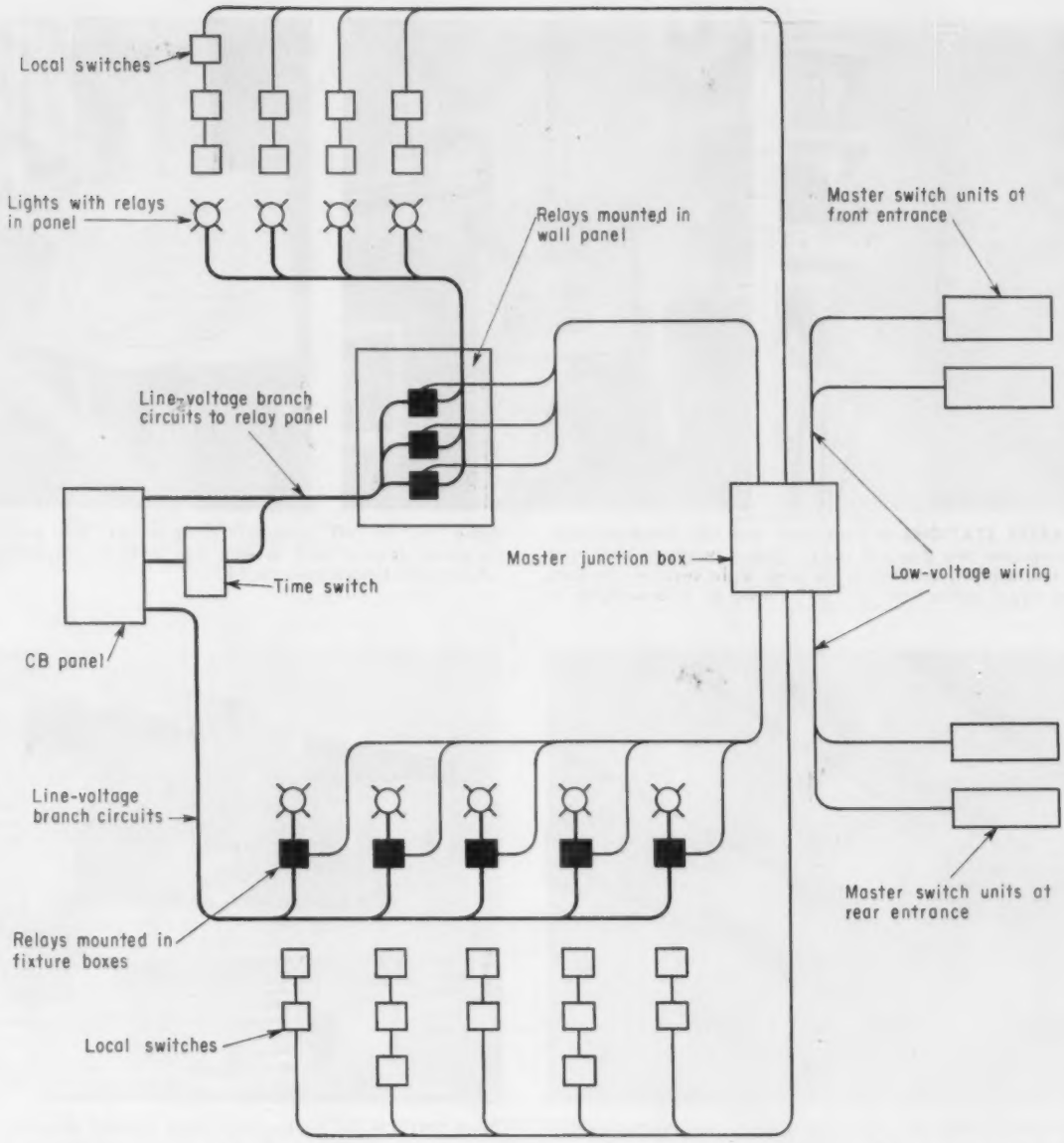
To insure safety of operation, overload limit switches are tested and adjusted (with a 900-lb load) every six months. A slack-line switch on the stationary hoist is tested prior to each window-washing operation. This once-per-washing inspection schedule is likewise maintained for testing hoist limit switches. Automatic brakes are thoroughly inspected twice a year, and hoist cables are carefully examined before each window-washing routine, or every 10 days if the operation exceeds this length of time.

In operation, all components of the spider staging are assembled and checked at ground level, then bumpers are attached and the anti-sway device is positioned in the mullion corresponding to the vertical area to be cleaned. The spider is then raised by means of the stationary hoist, and personnel riding the staging insert the power cable plug into the correct receptacle. When the staging is correctly positioned, the trolley roller rigging is attached to the overhead monorail and the window-washing operation can commence.

This initial auxiliary hoisting procedure is repeated for each face of the building.

Washing order is from the top to the bottom following vertical mullion lines; the stage being progressively raised to the upper limit each time, and the anti-sway device being shifted to the next successive position.

With tall air-conditioned sealed-window buildings increasing in numbers all over the country, this electrically-powered and controlled window-washing stage should prove beneficial in countless instances where access to outer glass surfaces would otherwise be a tedious, dangerous proposition.

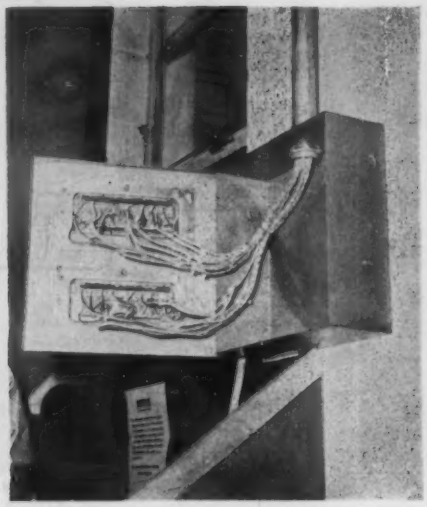


SIMPLIFIED WIRING PLAN shows layout of system components. Heavy lines represent line-voltage wiring in conduit, light lines low-voltage wiring stapled to ceiling joists.

Remote Switching for Small Plant

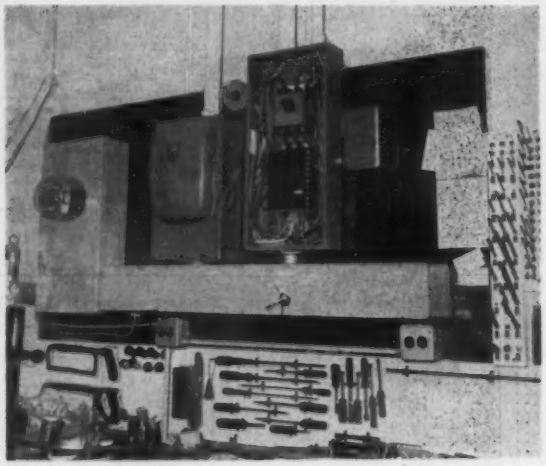
Apex Signal Services, manufacturers of custom burglar alarm systems, use low-voltage relay switching for control of all lighting circuits.

PILOT-LIGHTED 6-volt momentary-contact switches control all lighting branch circuits in the offices and production area of Apex Signal Services, Hillside, N. J. All rooms have two or three interconnecting doors, and it was felt that relay switching would permit control of room lighting from each entrance without resorting to 3- and



MASTER STATIONS at front (left) and rear entrances each incorporate two 8-switch units. Center switch of each unit is mechanically coupled to the other eight switches; pressing the center switch "on" or "off" causes all other switches to make "on" or "off" contacts. Front masters were mounted on plaster rings directly in wall; rear units were mounted in cabinet with hinged cover (right).

JUNCTION BOX for low-voltage wiring is mounted on ceiling of production area. All switch legs, including spares, appear in this box for convenience in adding new switches or new relays.



TIME SWITCH for outdoor and night lighting mounted adjacent to distribution panel at service entrance permits night circuit to be energized only during period determined by time switch settings.

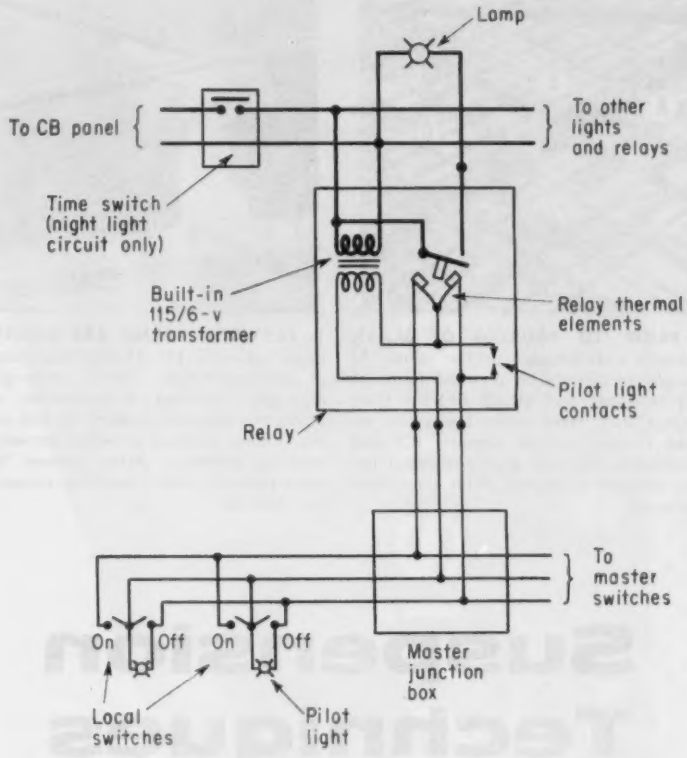
4-way switches and at the same time provide facilities for pilot-lighted master control of all circuits from the building entrances.

In most cases a 15-amp Remcon 6-volt relay with built-in 115/6-volt transformer was placed in the junction box of one of the fixtures to be controlled. Where the fixtures were located outdoors, or where considerable work would have been involved to remove the fixture to gain access to the relay in case of trouble, the relays controlling these circuits were mounted in a group in a wall panel.

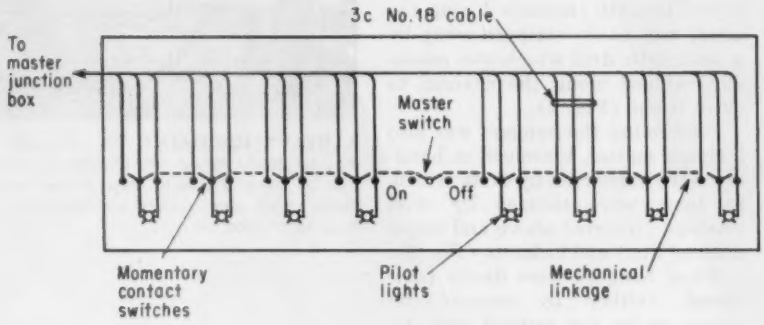
Interior night lights and outdoor floods were placed on the same circuit and wired to the circuit breaker panel through a time switch, which is set to energize the circuit at dusk and kill the circuit at dawn. This arrangement eliminates the possibility of having the night lights on for long periods during the day without discovery should the wrong switch be pressed accidentally.

Two 8-circuit master stations are located at each of the two main entrances to the building. All lights in the building may be controlled from either of these locations, either individually (by pressing the appropriate switch) or collectively (by pressing the center master switch of each unit).

Spare switches are available at each entrance for future circuits. These were completely wired when installed, the 3-wire 18-gage cable being dead-ended along with all other switch feeds in a master junction box mounted on the ceiling of the production area. As new lights are installed, low-voltage conductors from the relays are brought to this junction box and



TYPICAL RELAY CIRCUIT. Main relay contacts are operated by expansion of either "on" or "off" thermal element. Pilot-light contacts are closed mechanically along with line-voltage contacts when switch is pressed to "on", by-passing "off" thermal element. (Small pilot-light current is insufficient to operate relay to "off".) When switch is pressed "off", pilot light is shorted out, and pilot-light contacts are opened mechanically.

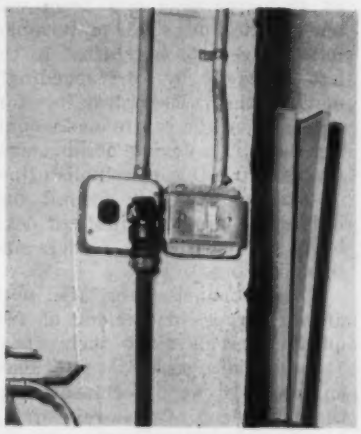


MASTER UNIT. Each unit contains eight circuit switches plus center switch which, when pressed, mechanically operates all switches simultaneously. Low-voltage conductors are paralleled with local switches in master junction box, at local switches, or at relays, whichever is most convenient. Switches may also be pressed individually to control their respective circuits.

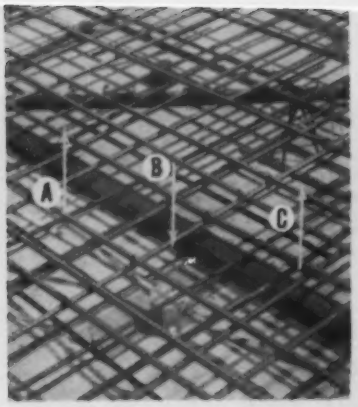
spliced to the appropriate switch feeds. If it is desired to install additional switches to control existing circuit, the new switches may be wired in parallel with existing switches by splicing either to the switch legs in the master junction box, to the appropriate relay, or to the existing switch terminals.

All switches, local and master, are equipped with built-in jeweled pilot lights which are energized when the relay is in the "on" position. The pilots do not require additional wiring or extra transformers, since a contact is built into the relay to operate the pilot lights. Thus each switch indicates whether its controlled fixtures are on or off. Also, a glance at either of the master stations will indicate which of the building's lights are on.

To provide mechanical protection for the low-voltage conductors, all local wall switches are mounted on 4-in. square outlet boxes equipped with a cover with a raised single-gang opening. The 3-conductor No. 18 switch cables are carried in conduit to the ceiling and run exposed, stapled to ceiling joists, to relays, junction boxes or other switches.



LOCAL SWITCHES at entrance to garage are typical of those in production area. Conduit protects low-voltage conductors from physical damage as far as ceiling. No line-voltage wiring appears in switch boxes.



1. PRIOR TO POURING OF SLABS, channels with frequent anchor straps (A) are placed directly on plywood forms at 6-ft intervals and at 45 degrees from column lines. Deep outlet boxes (B), related conduit, tripod supports (C) and reinforcing bars are also positioned before concrete is poured. After slabs have hardened . . .

2. PLYWOOD FORMS ARE REMOVED and diagonally placed channels cleaned of residual cement "skin" covering by manually skidding a pneumatic drill along the recessed grooves. In this process, rolling scaffold provides convenient working platform. After grooves have been cleaned of any overflow cement in this manner . . .

3. LIMITLESS FLEXIBILITY for positioning of fixtures, busducts or other equipment is obtained. This mounting means also makes it possible to suspend additional service facilities at a later date without having to establish other anchors, worry about interference of slab-reinforcing steel or be concerned about load-bearing capacities of supports.

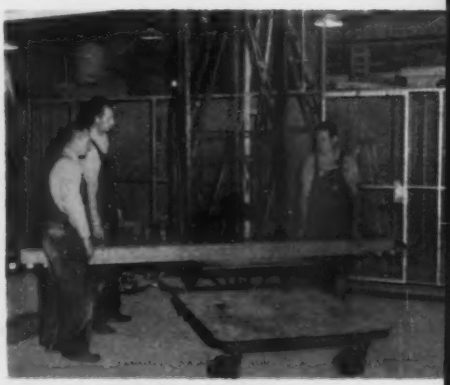
Suspension Techniques

SEVERAL interesting installation methods noted on the Marchant Calculator job in Oakland, Cal., pertain to the support of busducts, conduit banks and lighting fixtures. The first method involves the integral casting of recessed lipped channels into the undersides of floor slabs, with channels in parallel rows on 6-ft centers at 45-degree diagonals from wall and column lines. This pattern permits hangers to be shifted to the left or right by correspondingly moving them backwards or forwards along the continuous mounting slots. This flexible arrangement makes it possible to establish lines of hangers wherever desired, and it likewise provides limitless flexibility for positioning feeders and lighting runs.

These channels, fabricated with anchor straps spot-welded at frequent intervals along their upper (closed) sides, were first positioned on top of plywood forms prior to the placement of slab-reinforcing bars and the subsequent pouring of concrete (Fig. 1). After concrete slabs had hardened and forms had been removed, any "skin" covering of cement (which might have flowed beneath channels during the pour) was easily stripped away by a pneumatic drill which was manually skidded along the channel to clean it out (Fig. 2).

Positioning the hangers was also a simple matter, inasmuch as hangers were supported by bolts which, in turn, were secured by steel washers (inserted above and below channel lips) and locknuts (Fig. 3).

When hangers were finally positioned (either by conventional means or by the method just described), busducts (or sections of fixtures) were raised into position either by a mobile hoist (Fig. 4) or by manually operated jacks secured to corner uprights of sectional pipe-framed scaffolding (Fig. 5). Use of these hoists and jacks greatly minimized manual labor; permitted accurate positioning of equipment being installed; supported the equipment steadily while hangers, brackets or yokes were bolted into place; and (except for initial lifting of busduct sections from the floor to the lowered cradle of the mobile hoist) made it possible for a single worker to easily position and secure these heavy assemblies.



4. HEAVY EQUIPMENT, e.g. busducts, may be easily raised into mounting position by using a mobile hoist. After busducts reach approximate elevation they may be cradled on . . .

5. MANUALLY OPERATED JACKS mounted to corner uprights of pipe-framed scaffolding. Use of jacks minimizes manual labor, permitting single electrician to accurately position and secure hangers.

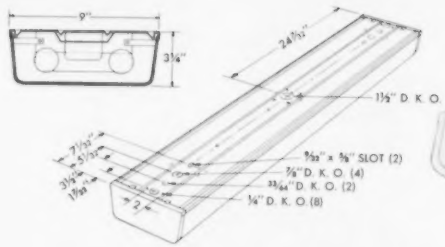

A jewel of a fixture
at a down-to-earth price
the wonderful WAKEFIELD
prismatic
Below—Actual size photograph of clear plastic lens.

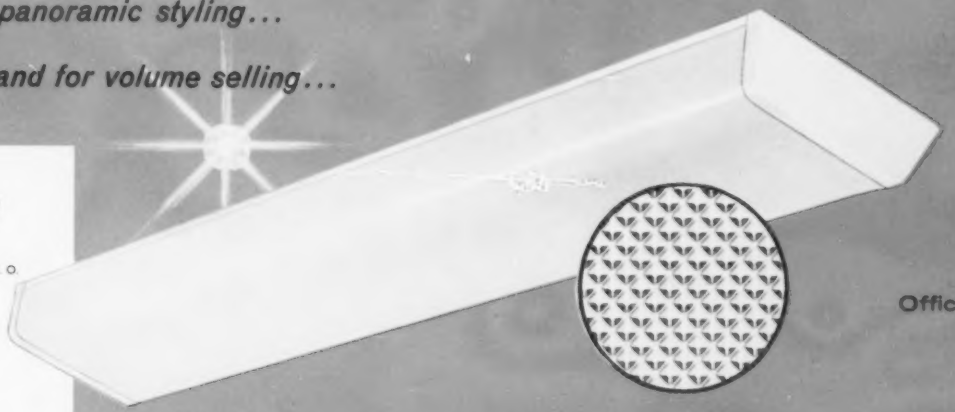
the wonderful

WAKEFIELD® prismatic

TRADE MARK

...is wonderful because it goes practically everywhere...installs in a jiffy...has beautiful panoramic styling... is priced to delight the user and for volume selling...





Catalog Number	No. of Lamps	Description	Std. Wt.—Lbs. Pkd.	Unpkd.	Pkg. Quan.
R-214	2-F40T12/RS	Wakefield Prismatic	16 30	14 28	1 2

If your customer needs approximately 50 footcandles, install *one* Prismatic for every 40 square feet of area.

Suggest to your customer that he paint his ceiling white and his walls a light color.

eye-fi LIGHTING

Thousands of interiors are waiting for the Wakefield Prismatic. It's a natural for virtually all commercial, office and institutional areas. A beautiful, practical, inexpensive four footer with graceful one-piece clear plastic lens diffuser. All steel parts are white-enameled. Takes two Rapid Start lamps. Installs easily directly on the ceiling, singly or in continuous rows. IBEW, UL/CSA labeled. Jefferson CBM/ETL, HPF ballast.

Stores of All Kinds
Supermarkets
Florists
Beauty Shops
Barber Shops
Auto Show Rooms
Restaurants
Banks
Schools
Colleges
Laboratories
Libraries
Offices of All Kinds
Doctors
Dentists
Work Rooms
Repair Shops
Drafting Rooms
Kitchens
Bathrooms

Distributed by Graybar

Distributed by Graybar in over 130 principal U. S. cities and leading distributors in Canada

WAKEFIELD

THE WAKEFIELD COMPANY — VERMILION, OHIO
WAKEFIELD SOUTHWEST COMPANY—OKLAHOMA CITY, OKLA.
WAKEFIELD LIGHTING LIMITED—LONDON, ONTARIO

Data Sheet 2-59

Tear out this page—it's perforated for your convenience.

Adjustable Floor Hides Cables

METHOD

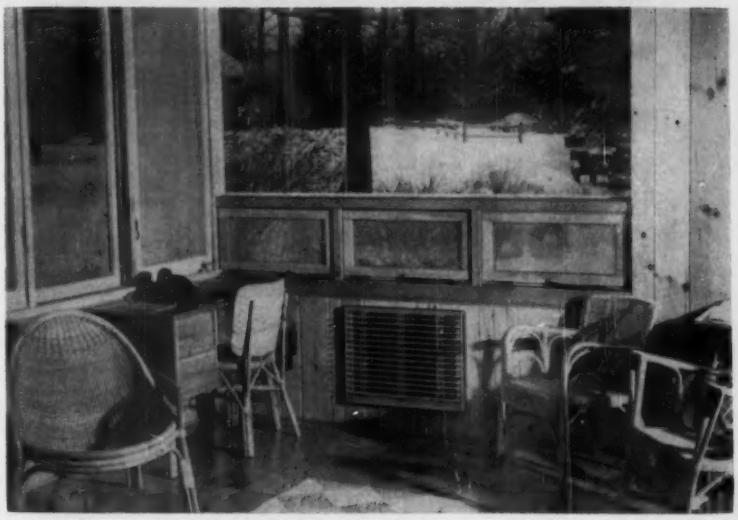
An elevated adjustable floor system consisting of metal framing and adjustable steel screw jacks has been installed in a data processing room to hide the numerous power and transmission cables. The adjustable floor system which frees the room of exposed cords was designed to support heavy weight loads at any location, even though unequally distributed.

The metal framing used in the grid framework of the elevated floor system offers strength without bulk while providing a maximum of underfloor cable space. Grid members are 1⅝ ins. wide, and are made of 12-gauge steel with pyramid-shaped inturned edges. The framework is attached to the jacks with a spring-held nut and cap screws. The steel screw jacks provided a total adjustment of 3 ins., with various heights available for desired elevations.

Floor panels used in the system are of rigid sandwich construction totally enclosed in metal, with tapered aluminum edging to facilitate removal. A suction cup lifter will remove any panel easily to gain access to the cables. Standard panels are 3-ft square and are topped with ⅛ in. of vinyl tile that is available in a variety of colors. Panels are cut at the job site to fit around obstructions and to meet perimeter conditions. Cutouts for the cables are also made on the job wherever they are needed.

The flooring system was developed specifically to accommodate the complex maze of power and data transmission cables needed for data processing equipment. The installation not only provides for the initial equipment, but also permits relocation or addition of units.

ELEVATED ADJUSTABLE FLOOR SYSTEM installed in this data processing room leaves the entire floor area free from maze of power and transmission cables needed to operate data processing machines. Inset picture shows the adjustable screw jacks and metal framing grid that holds the 3-ft finished floor panels hiding the cables.



ELECTRIC WALL PANELS rated at 1000 watts take the chill out of late summer evenings and maintain low-level heat during the winter in the buildings of the AMA's new Academy in Saranac Lake, N. Y.

Electric Units Heat AMA Academy

HEATING

Twenty-one modernized buildings comprising the American Management Association's new Academy of Advanced Management on a 90-acre site at Saranac Lake, N. Y., proved to be an ideal application for electric heat in several respects.

(1) Long runs of piping or ductwork, necessary to connect the widely scattered units using any conventional central heating system, were eliminated.

(2) Since the research and study center would not be used during the winter months, the absence of flame and combustion provided safety from fire hazard during this period—yet minimum required temperatures were maintained in the buildings.

(3) Without a fuel-type heating plant, no maintenance help was required.

(4) The quiet operation, automatic control and quick-heat characteristics of the heaters were well suited to classroom use, where noise and constant manual adjustment would be distracting during the chillier late summer evenings.

The 1000-watt units were installed in the classrooms, guest houses and central dining room by Janry Sales Co., electrical contractors of Green Island, N. Y.

Plastic Conduit for Underground Circuits

WIRING DESIGN

Butyrate plastic pipe was recently successfully applied by Patchogue Electric Light Company, Long Island, N. Y., as a raceway for underground street lighting circuits. The success of this application has begot plans for more extensive use of plastic pipe raceway.

The company switched from galvanized steel to butyrate conduit for power cables last summer when it installed four street lights along William Floyd Parkway, in Shirley, a small residential community on Long Island. The insulated conductors are neoprene jacketed type suitable for direct burial. The conduit is used to provide ready removal of the cables in the case of fault or to change the size of the cables if that should ever be necessary.

Robert W. Allen, PELCO purchasing agent, reports he found butyrate pipe a light, tough, corrosion-resistant product that can be bought and installed with economy. The cost was around 11% below the metal pipe price. More significantly, use of the new material cut installation costs 25%, says Mr. Allen.

"It is easily handled and joined, and is also semi-flexible," he explains. "In the past when we came to a tree stump, we had to stop and dig it up. With butyrate conduit, we just go around the stump."

The installation required 1,400 ft of 1½-in. pipe, in lengths of 20 ft, each weighing 6¾ lbs. On the Shirley project, prefabricated 90-degree sweeps of butyrate conduit

ONE WORKMAN was able to carry a supply of lightweight plastic pipe from a small truck to the installation site. Pieces are 20-ft long, each weighing 6¾ lbs.

Safest switches known

—in every size from 30 to 1200 amps

Large or small, BullDog Clampmatic® Vacu-Break® Safety Switches provide *maximum* protection . . . meet most every switching need. They provide added safety because of these two exclusives: The unique Clampmatic spring increases the pressure against contact jaws . . . assures clamp-tight connections . . . faster break . . . *really safe operation*. Vacu-Break action snuffs arcs immediately . . . reduces pitting and burning of contacts for long, trouble-free switch life.

BullDog's "Big Three" safety switches, the "Master", "Junior" and "Raintight", assure positive switching . . . virtually eliminate costly maintenance. Give your customer this extra safety, extra performance now with BullDog Vacu-Break Safety Switches.

For safety's sake buy Vacu-Break

BULLDOG ELECTRIC PRODUCTS DIVISION
I-T-E CIRCUIT BREAKER COMPANY
BOX 177 • DETROIT 32, MICHIGAN

In Canada: 80 Clayson Rd., Toronto 15, Ont. Export Division: 13 East 40th St., New York 16, N.Y.

LIGHTING CIRCUIT conductors were enclosed by slipping the plastic pipe sections over the power cables and then joining them. The complete run was assembled along the edge of the ditch and then lowered into place.

PREFABRICATED BENDS of plastic conduit were cast into poured concrete pole-base, to connect to the trench run and carry the conductors up through the base to the pole. A solvent-cement was used to hold the end of the pipe in the slip-sleeve coupling on the bend section. Two insulated No. 4's and one bare No. 6 are installed in the conduit. Plastic pipe forms a permanent, watertight cable enclosure for its entire length.

were cast into poured concrete bases for the four aluminum poles, set 400 ft apart for the 110-220-volt, mercury-vapor, photoelectric-controlled installations.

The installation procedure was as follows:

One of three workmen on the project loads a supply of the lightweight butyrate conduit in his arms and carries it to the installation site, a 24-in. deep trench dug by a back hoe.

The conduit along with butyrate slip-sleeve couplings is then slipped over the cables—two No. 4 insulated and jacketed wires and one No. 6 bare copper wire—that have been extended between the bases.

Joining of the conduit lengths is

"PAIRED PHASING" HELPS YOU MEET THE LOAD...WITH POWER TO SPARE

Lo-X Bus Duct assures lower balanced voltage drop . . . extra current carrying capacity

Increase your safety margin against unexpected power fluctuations! BullDog BUStribution®—using a paired phased arrangement of aluminum bus bars—neutralizes magnetic fields, assures uniform balanced current distribution and low voltage drop. Exclusive "paired phasing" acts to distribute current equally throughout the cross-sectional area of each conductor . . . balances current among all conductors . . . reduces impedance to a minimum. Full use of the conductor material assures extra capacity, allowing the LO-X feeder system to operate at top efficiency.

And LO-X offers these additional operating advantages. The duct has no moving parts . . . thus nothing to wear. It is prefabricated . . . adapts to any building contour. Exclusive scarf-lap joints assure rigid connections . . . speedy installation. BullDog's five-step silvering process of aluminum bus bars guarantees maximum conductivity at connection points. Special spring-type cup washers at the joints give a positive *bolted* connection.

For a distribution system that guarantees top performance and long, continuous service settle on *Bus Duct by BullDog* . . . it will readily adapt to your client's changing power needs.

BULLDOG ELECTRIC PRODUCTS DIVISION
I-T-E CIRCUIT BREAKER COMPANY
BOX 177 • DETROIT 32, MICHIGAN

In Canada: 80 Clayson Rd., Toronto 15, Ont. Export Division: 13 East 40th St., New York 16, N.Y.

accomplished by taking an ordinary paint brush and applying a solvent cement to the couplings and the conduit ends. There is no need for threading as in the case of metal pipe and, when a workman finds it necessary to cut a length of conduit, he simply uses a handsaw.

When the joining has been completed, the conduit is lowered into the trench. It follows ditch contour without need of further fittings, the material is that flexible.

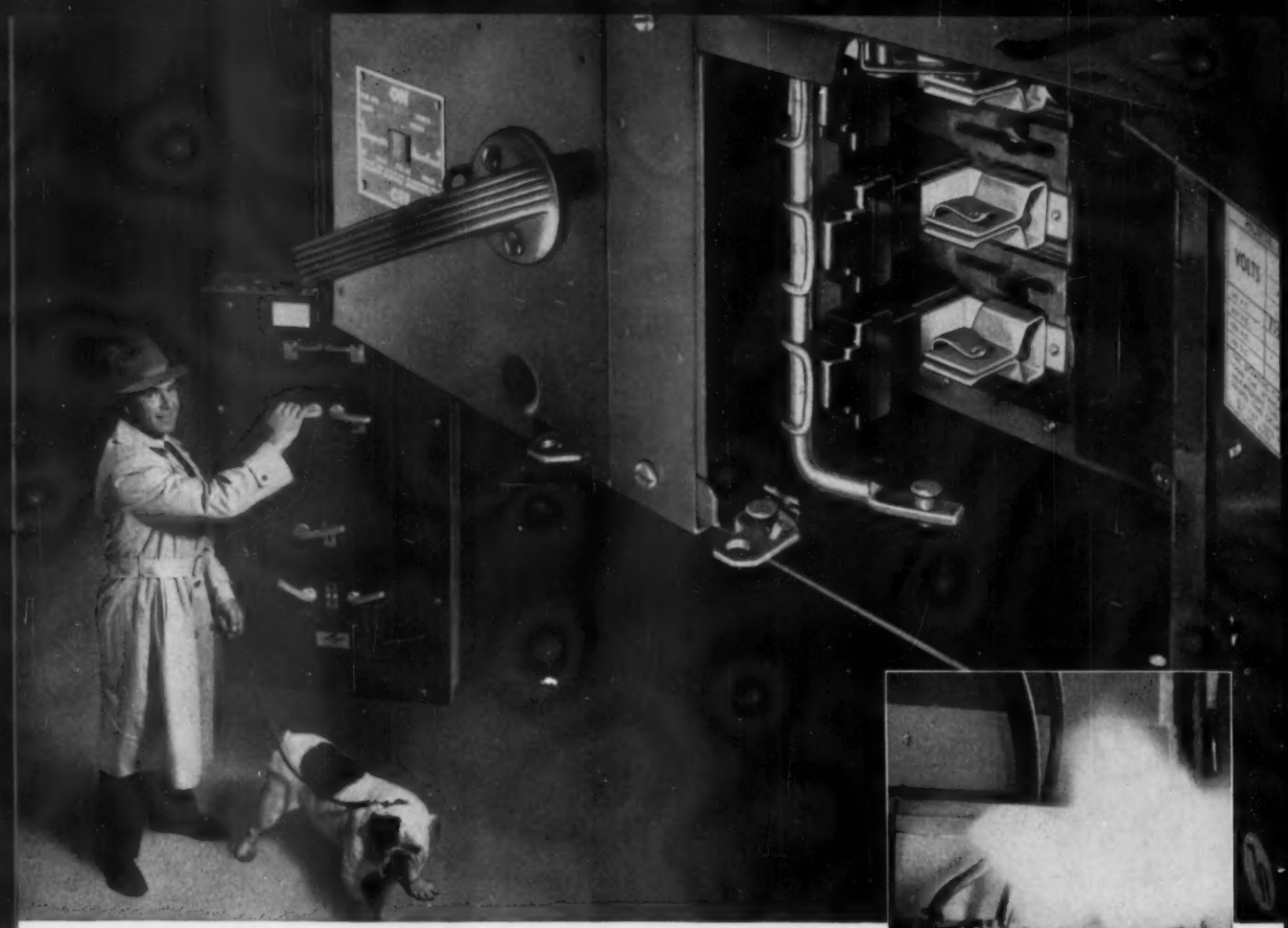
Mr. Allen says conduit lengths were joined and the line placed in approximately half the time metal conduit requires. While a trench depth of 12 ins. is all that is usually required, a deeper ditch was used here to provide the conduit every protection from heavy equipment that was to arrive soon after to resurface the road.

Trailers Solve Jobsite Material Storage Problems

EQUIPMENT

Super Electric Company of Chicago has reduced the costs of providing on-the-job storage and office sheds by building-up a fleet of eight semi-truck trailers. Six of the eight trailers are used for material storage with space allotted when necessary to provide for a small desk for the job foreman. The remaining two trailers are outfitted for exclusive use as offices and are employed mainly on large projects.

SEMI-TRUCK TRAILER serves as portable jobsite material storage shed. Unit is delivered to project completely loaded with necessary job supplies. Trailer protects material and tools from weather and after working hours is securely locked to prevent access to contents by unauthorized persons.



Dangerous flash explosion occurs at instant of "break" in open knifeblade switch . . . causing blades to burn, pit, deteriorate. (This photograph and the one below are unretouched.)

FOR SAFETY'S SAKE, BUY VACU-BREAK POWER PANELS

Here are some basic facts why BullDog Power Panels with Vacu-Break* units are tops in safety and performance. Vacu-Break design minimizes destructive arcs because contacts are housed in compact chambers that extinguish the arcs immediately. Result: maximum safety . . . virtually no pitting or burning of contacts . . . minimum maintenance. Vacu-Break switch units are "quick-make, quick-break" with an interlocking safety mechanism. Contacts are *directly* attached to operating handle. No tricky toggles or springs. You get positive, safe switching always. And when the handle is in OFF position, you *know* the switch is *off!*

The Clampmatic* design provides clamped-pressure switching contacts to prevent overheating at these points. Needless heat-generating areas are eliminated because there are no hinged, current carrying parts . . . and all conductors are silvered. BullDog switches also withstand severe fault currents. In recent tests, standard BullDog switches with Amp-Traps** were subjected to a 100,000-amp short circuit current. *They were undamaged!*

For safety's sake—and superior performance—specify BullDog Vacu-Break Power Panels.

BullDog Vacu-Break chamber smothers arcs before they can cause damage. Both are 100-amp, 600-volt switches, operating under 90-ampere, 440-volt load with 40% to 50% power factor.

BULLDOG ELECTRIC PRODUCTS DIVISION
I-T-E CIRCUIT BREAKER COMPANY
BOX 177 • DETROIT 32, MICHIGAN

In Canada: 80 Clayson Rd., Toronto 15, Ont. Export Division: 13 East 40th St., New York 16, N.Y.

*Vacu-Break and Clampmatic are registered trademarks of the BullDog Electric Products Company. **Amp-Trap is a registered trademark of the Chase-Shawmut Company.

INSIDE SHELVING constructed of slotted angle framing keeps material in visual order. Desk used by job forman for blue prints, etc. is fitted in center of shelf row (arrow). Angle iron framework (on left side of trailer) is sturdily constructed to hold an assortment of conduit sizes.

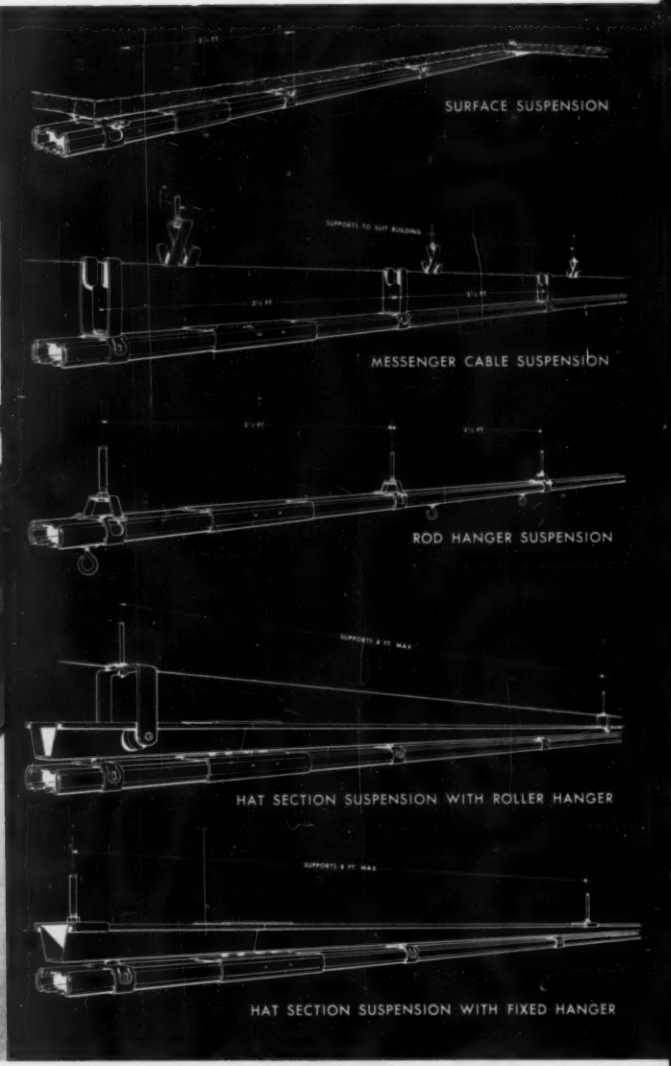
For most jobs Super Electric Company loads a trailer with the necessary supplies and tools, then hires a contact carrier (at a relatively small cost) to deliver the loaded unit to the jobsite where it will remain until the job is completed. This makes unnecessary the usual repeated shuttle trips by smaller trucks and eliminates much of the double handling of materials —an important consideration where large or heavy items are involved. The trucking firm, besides furnishing the driver and tractor to move the trailers, also takes care of all license fees and insurance coverage.

In many cases, especially when a job is extra large, the trailer is loaded with all the necessary roughing-in material and delivered to the project site. Then when the job reaches the finishing stage the trailer is hauled back to the shop and reloaded with finishing supplies (such as fixtures, lamps, wiring devices, etc.) and returned to the job.

The trailers more than proved their worth on Super Electric's recent wiring job carried on over three connecting Illinois Tollroads. The job called for installation of lighting at the various approaches to the roadway system plus an electric de-icing system embedded in the concrete at each of the toll collection plazas. Half of the electrical work on the 187-mile Tollroad was installed by Super Electric. Since the superhighways for the most part were constructed in open country and outlying districts far from their home office, the problems of how to store material and tools in open country, and how to reduce trucking trips from their home shop, had to be solved. The answer was semi-truck trailers. Super used

clamped-pressure switching con-

*Vacu-Break and Clampmatic are registered trademarks of the BullDog Electric Products Company. **Amp-Trap is a registered trademark of the Chase-Shawmut Company.



TAKE YOUR CHOICE...
UNIVERSAL LIGHTING DUCT OFFERS 5 METHODS OF SUSPENSION!

You can solve virtually any lighting fixture placement problem with Bull-Dog Universal Lighting Duct. The prefabricated, standardized duct is amazingly easy to assemble and you have your choice of *five different suspension methods* for either the 20-amp or 50-amp ratings. One or a combination of these methods will adapt to any structure . . . and meet any installation requirement quickly and economically.

"ULD" is a continuous electrical outlet, with conductors running the entire length of the duct. Duct sections telescope together mechanically and electrically by a plain coupling. Light fixtures connect quickly by means of twist-out plugs which can be added or repositioned at any point. Plugs are available for direct fixture attachment or will take a standard attachment cap. The duct both feeds and supports fixtures . . . can be easily disassembled and relocated as lighting needs change.

You'll find Universal Lighting Duct is less costly than installed pipe and wire. And if the lighting plan is altered during construction, "ULD" can be repositioned without time-wasting "rewiring."

On your next wiring job look into the economies of Universal Lighting Duct. You'll find it is the most efficient, economical and flexible lighting duct system available. "ULD" is U/L listed.

BULLDOG ELECTRIC PRODUCTS DIVISION
I-T-E CIRCUIT BREAKER COMPANY
BOX 177 • DETROIT 32, MICHIGAN

In Canada: 80 Clayson Rd., Toronto 15, Ont. Export Division: 13 East 40th St., New York 16, N.Y.

four of them, each centrally located to work areas in their group. Individual pickup trucks were then employed to make the "short hops" between each trailer and the work location points in its group.

This really paid big dividends, besides eliminating the exorbitant costs of building storage sheds at the various points of installation, and the time and costs of trucking materials were drastically reduced.

Aside from solving all of the above objectives, the trailers serve as an excellent advertising means.

Low-Voltage Signal for Confessional Booth

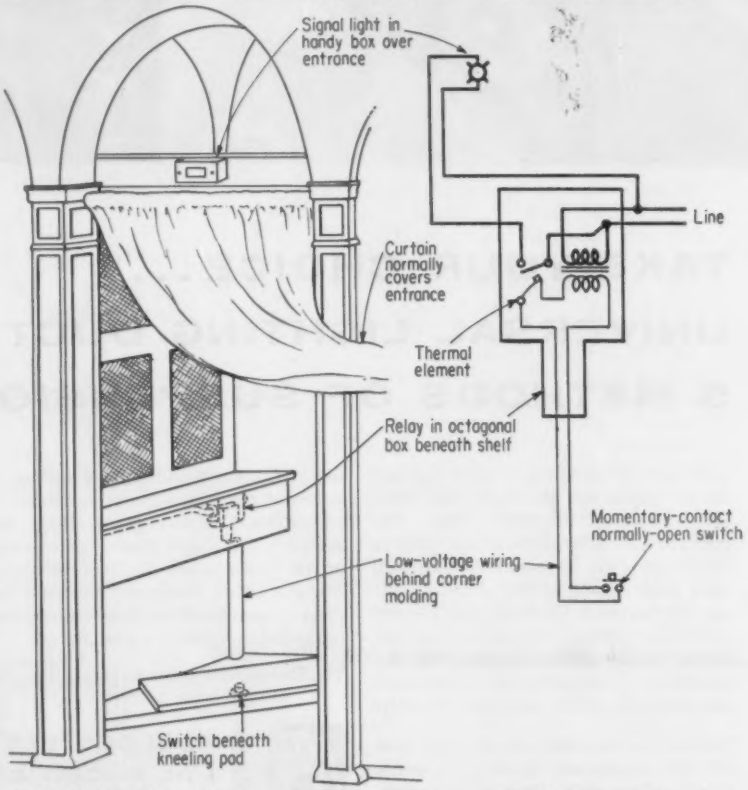
WIRING

Installation of a Remcon closet-light relay using low-voltage switching provided a unique solution to a recurring problem encountered in the use of confessional booths of the Sacred Heart Catholic Church, Washington, D. C.

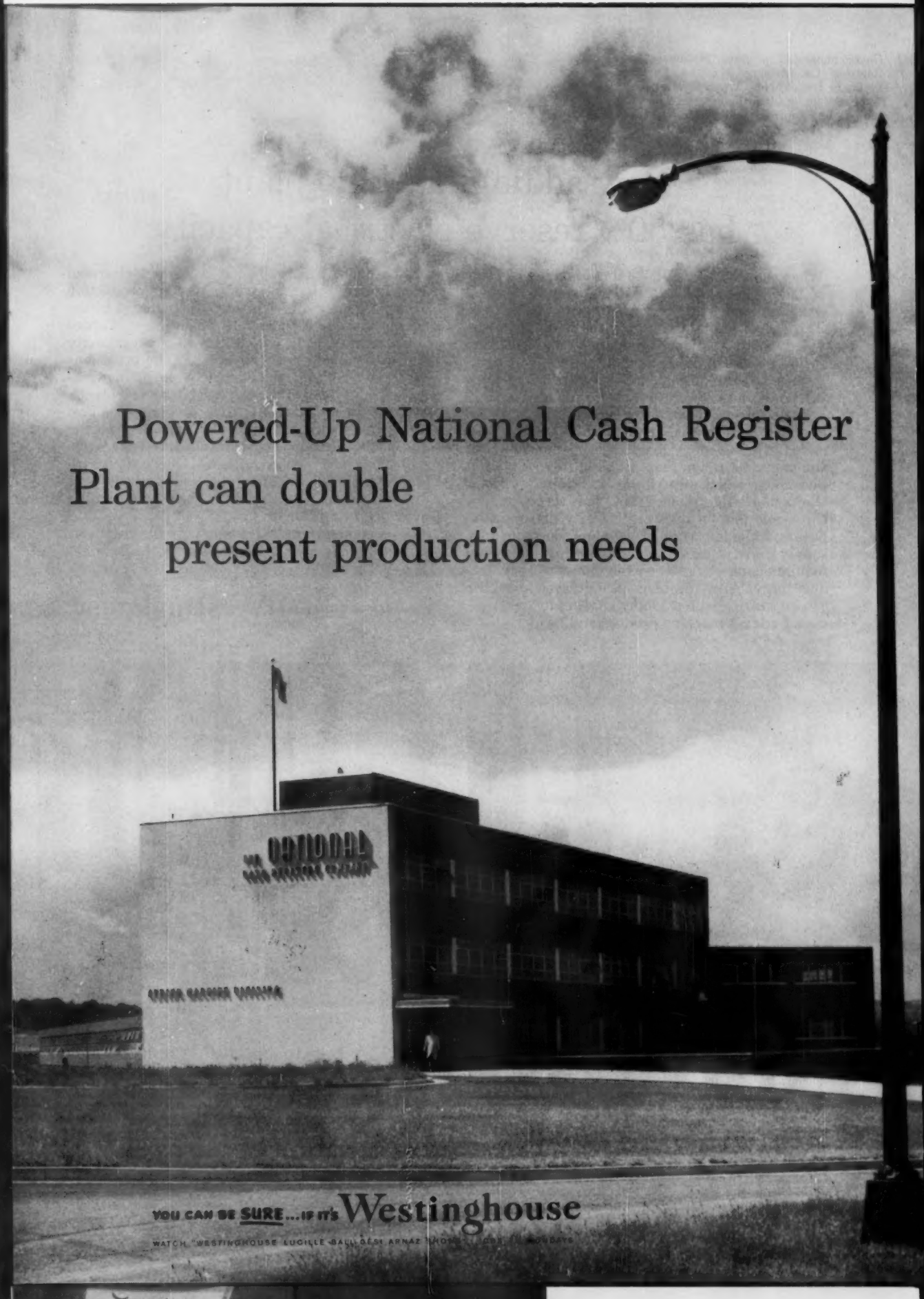
Repeated complaints of people entering occupied booths resulted in the decision to provide a signal at the entrance which would indicate when the booth was in use. Because curtains are employed to screen the booth entrances, the installation of jamb-type switches was ruled out. Since the occupant uses the booths in a kneeling position, it was decided to install the light switch beneath the kneeling pad, activated by the pressure of the person on the pad. Use of low-voltage wiring was considered desirable from a safety standpoint, at the same time eliminating the need for running exposed raceway on the masonry wall.

The closet-light relay filled the need, since it incorporates a 115/6-volt impedance-limiting transformer, employs a 6-volt switching circuit, and may be mounted in a standard 4-in. octagonal box.

The box was mounted beneath a shelf in the booth as shown in the accompanying sketch. The line feed was brought in through the wooden separating partition; No. 18 conductors to the switch were concealed behind corner molding. A small pilot light was mounted in a handy box over the entrance, covered by a switchplate containing a red jewel over the opening. Light from the jewel is clearly visible to persons approaching the booth, yet it is entirely inconspicuous to the rest of the church.



SIGNAL LIGHT for church confessional booth is controlled by low-voltage relay. Pressure on kneeling pad closes transformer secondary circuit, heating relay thermal element and closing primary contacts in lamp circuit.


Powered-Up National Cash Register
Plant can double
present production needs
YOU CAN BE SURE...IF IT'S Westinghouse

Cover photo — Top: New National Cash Register Co. Adding Machine Division Plant, in Ithaca, New York. Westinghouse Type OV-20 outdoor lighting is used for the building approach and parking area.

New adding machine plant has 50% reserve electrical capacity

When the Ithaca, N. Y., Adding Machine Division of The National Cash Register Co. found its existing plant inadequate, a new plant site was secured. The design and planning for the new plant provided more efficient production methods and future plant expansion as required.

Once space requirements were satisfied, electrical power needs were detailed. An all-Westinghouse electrical distribution system was specified to meet these needs. A 2000/2300-kva, double-ended power center, located near the middle of the manufacturing area, feeds ten runs of plug-in bus duct which distribute low-voltage power throughout the plant. Six runs of 600-amp, three-pole plug-in duct are used for 480-v distribution, while four runs of 600-amp, four-pole duct supply 277 wye/480 v for both lighting and power requirements. Use of Westinghouse plug-in bus duct provides a flexible, efficient system which can be easily adapted to any changes in the automated adding machine production line.

The new Ithaca plant has 50% more electrical capacity than is required by present production needs. The new 146-acre site (as compared to the previous six acres) is ample for anticipated space requirements, while the electrical system capacity can be doubled simply by utilizing the provisions for expansion and the spare equipment now installed. An interesting example of the new plant's expansion possibilities is that the present plant structure can be extended 600 more feet to the back. The location of the installed power centers will allow any necessary new feeders to be installed with minimum distance and voltage drop. In some cases, present bus duct runs can be extended into the new area.

Westinghouse worked closely with the architect, consulting engineer, general contractor, electrical

(continued)

Conference room discussion includes Charles T. Hansen, Westinghouse Sales Engineer; John M. Schweiger, Schweiger, Heapy & Associates, Consulting Engineers; James Miller, Westinghouse Construction Sales Engineer; Clair Dean, Buffalo Electric Co., Electrical Contractors and Westinghouse Distributor; Ed Likens, Professional Engineer, Lorenz & Williams, Architects and Engineers; and C. W. Vail, Plant Engineer, Adding Machine Division of The National Cash Register Co., Ithaca, N. Y.

J. Victor Bagnardi, Ithaca representative of Lorenz & Williams, and John M. Schweiger are shown in electrical equipment room. On wall facing them can be seen four Westinghouse panelboards and a Westinghouse 50-kva, 480-v primary to 120/240-v secondary, single-phase, DS-3, dry-type transformer. Two of the panelboards are NLAB 120/240v, one is a NHIB 277/480v, and the opened panelboard in the foreground is a CDP 277/480v. J-94087-2

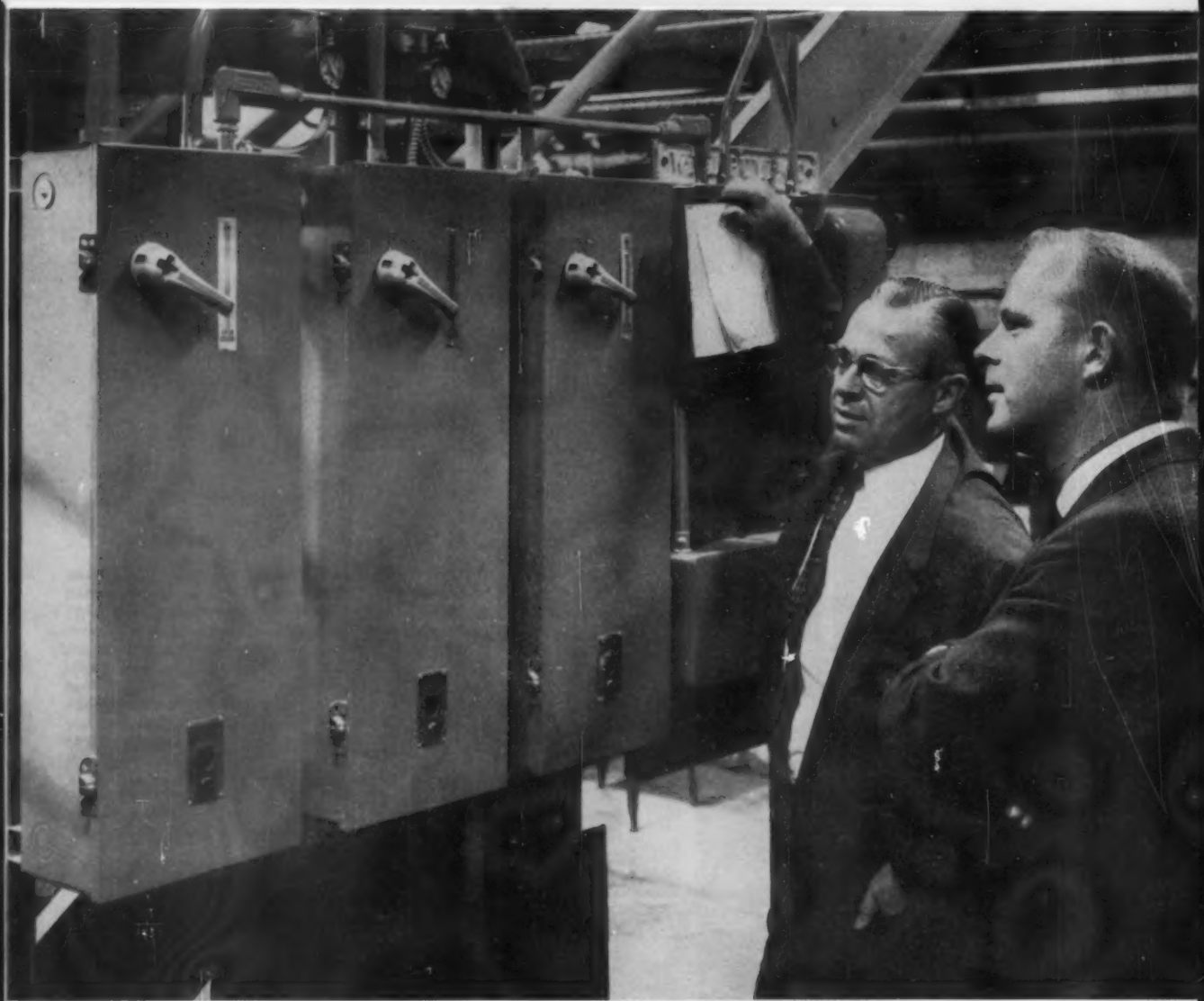
General plant view shows multiple runs of Westinghouse 2WVO-40R, 277-v fluorescent lighting and 600-amp copper plug-in bus duct. Plug-in units shown are circuit breaker type. Plug-in bus duct and circuit breaker plug-in units are standard requirements in The National Cash Register manufacturing plants.

Clair Dean, John Schweiger and C. W. Vail discuss details of Westinghouse 2000-kva, double-ended (one 1000-kva Inerteen® transformer each end) power center. Incoming voltage of 4800 is reduced to 480 wye/277. Each transformer has provision for 150 additional kva, so only fans need to be added when increased rating is needed. Four spare DB breakers are installed in board to take care of future load and, in addition, four cells are equipped to receive breakers when needed. (Note new switchgear design with three-position DB circuit breakers. Visible positioning tells at a glance if breaker is in "ON," "TEST" or "OFF" position. New "TEST" position allows testing of breaker in switchgear cell with complete safety.)

J-94087-3

Engineer, Lorenz & Williams, Architects and Engineers, and C. W. Vail, Plant Engineer, Adding Machine Division of The National Cash Register Co., Ithaca, N. Y.

120/240v, one is a NHTB 277/480v, and the opened panelboard in the foreground is a CDP 277/480v. J-94087-2



50% reserve electrical capacity *(continued)*

contractor and The National Cash Register Co. engineers in selecting the equipment which provides for present and future electrical needs. Westinghouse can also help you with any of your electrical planning and construction requirements. See your Westinghouse distributor, or write: Westinghouse Electric Corporation, Box 868, Pittsburgh 30, Pa.

J-94087-4

Owner: The National Cash Register Co., Dayton, Ohio

Architect: Lorenz & Williams, Architects and Engineers, Dayton, Ohio

Consulting Engineer: Schweiger, Heapy & Associates, Dayton, Ohio

General Contractor: Streeter Associates, Inc., Elmira, N. Y.

Electrical Contractor: Buffalo Electric Co., Inc., Buffalo, N. Y.

Westinghouse Distributor: Buffalo Electric Co., Inc., Buffalo, N. Y.

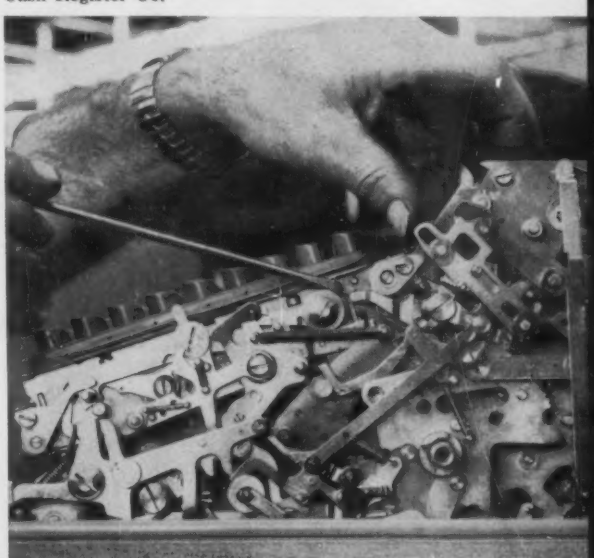
YOU CAN BE SURE...IF IT'S **Westinghouse**

WATCH "WESTINGHOUSE LUCILLE BALL DESI ARNAZ SHOWS" CBS TV MONDAYS

Over 200 Pages Westinghouse Data in Sweet's Construction File. (S)

Clair Dean and Charles Hansen examine three Westinghouse Class 11-204 nonreversing combination Life-Line® starters which provide control and overload protection for the motors in the equipment room.

Close-up view of adding machine mechanism as manufactured in Adding Machine Division of The National Cash Register Co.



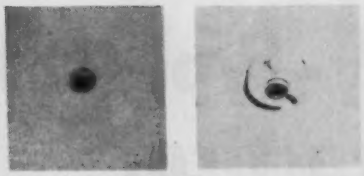
Fire Alarm Detector Installation

SIGNAL

With the growing interest in fire safety among homeowners and the rising popularity of fire detection systems has come the contractor's problem of making the installation pleasing in appearance to the housewife. Important as the detectors may be, the prospect of having one fixed to the living room ceiling in plain view has actually affected acceptance of the system.

One of the chief factors detracting from the finished appearance of the detector installation has been the prevalent practice of fastening detectors to the surface of the ceiling, with the entire detector body projecting into the room. While the labor involved in such an installation may be less than when the detectors are recessed, many contractors are following the practice in the mistaken belief that the operation of the detector in case of fire will be adversely affected by recessed mounting. Tests show that this is not so, *as long as the sensing element is not recessed.*

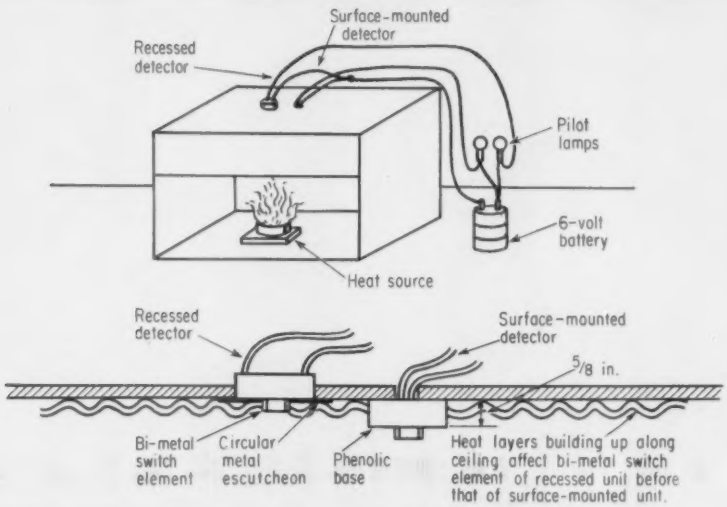
The detector most commonly used for residential installations, both closed- and open-circuit systems, consists of a bi-metal switch element enclosed in a ⅞-in. diameter cylindrical phenolic disc approximately ⅓₂ in. high, mounted on a composition base 1⅛ ins. in diameter and ⅛ in. high. The sensing elements are all in the small disc; the base merely encloses the terminals for connection to the circuit, imparts structural strength to the unit, and provides means of mounting the detector to the surface of the ceiling.



RECESSED DETECTOR (left) illustrates inconspicuous appearance of such an installation as opposed to the more obvious surface-mounted unit (right).

Operation depends upon contact between the bi-metal switch assembly and hot gases generated by the fire, both at the sides and at the bottom of the disc. Therefore, it is only necessary that the disc be entirely exposed beneath the surface of the ceiling; the composition base may be safely recessed into the ceiling.

The opening in the ceiling may be prepared quickly using a hole saw set into a brace or portable drill. To facilitate installation, a flat doughnut-shaped metal escutcheon is available to completely conceal the phenolic base. The lower face of the base is glued to the upper face of the escutcheon, the detector switch assembly projecting down through the center hole. The escutcheon is then glued directly to the ceiling and painted to match the ceiling, completing the inconspicuous installation.



SIMPLE TEST demonstrating detector action may be devised using a carton, dry battery, 6-volt lamps, a small can of "Sterno" or other source of heat, and two identical detectors. Completely closed area at top of crate simulates condition found in most rooms. Repeated applications of heat cause practically simultaneous operation of the detectors, with the recessed detector invariably the first to operate.

Sorgel dry-type transformers are most practical

SORGEL dry-type transformers can be installed at load centers, without fire-proof vaults, using higher voltage feeders, requiring smaller copper, increasing efficiency, improving voltage regulation, and reducing wiring costs.

COST LESS TO INSTALL, because they are all self-contained in a single unit — either single phase or 3-phase — equipped with substantial wall brackets or floor mounting base. No separate brackets to make or buy. Easily accessible, roomy connection compartment. Solderless terminals.

QUIETEST OPERATION. All Sorgel dry-type transformers are so quiet that they can be installed in any convenient place, close to load centers, in institutional, commercial and industrial buildings, thus assuring the most efficient distribution, best voltage regulation, and lowest wiring cost.

TYPICAL APPLICATIONS. Operate 120 volt lighting and portable equipment from 240, 480, or 600 volt power circuits.

For high voltage interior distribution systems of 2400, 4160, 4800, 7200, 13,200 and up to 15,000 volts.

to step down the higher distribution voltage to utilization voltage at load centers, in institutional, commercial, and industrial buildings, and

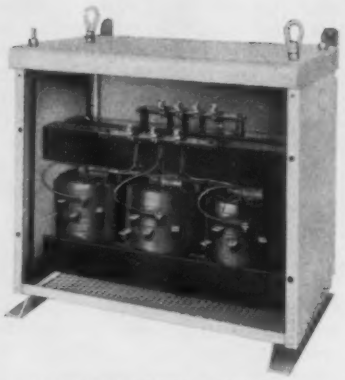
modernization projects

Complete line
1/4 Kva to 10,000 Kva
120 to 15,000 volts

Approved by Underwriters' Laboratories on all ratings covered by the Re-Examination Service, both single phase and 3-phase

•

Also special transformers and saturable reactors



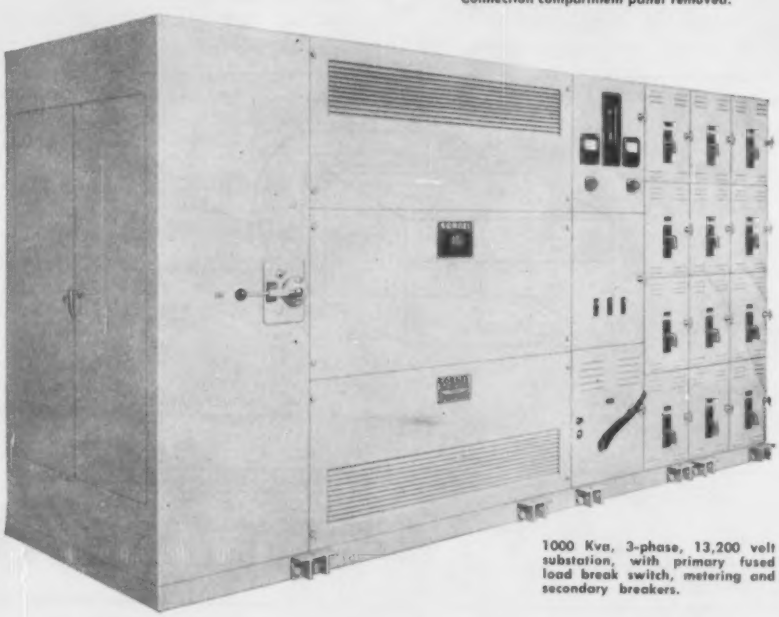
45 Kva 3 phase transformer with taps. Interchangeable wall or floor mounting. Connection compartment panel removed.

Substations

The same quiet SORGEL dry-type or Askarel-cooled transformers, in ALL ratings up to 10,000 Kva and up to 15,000 volts, are also incorporated in substations. Procurable with any type or make of switchgear, and from any substation manufacturer.

Sales engineers in principal cities.

Consult the classified section of your telephone directory or communicate with our factory.



1000 Kva, 3-phase, 13,200 volt substation, with primary fused load break switch, metering and secondary breakers.

SORGEL
SOUND-RATED DRY-TYPE
TRANSFORMERS

SORGEL ELECTRIC CO., 836 West National Avenue, Milwaukee 4, Wisconsin

Over 40 years' experience in the development, manufacturing and application of transformers

FOR MORE INFORMATION ON

NEW PRODUCTS
CATALOGS, BULLETINS
ADVERTISEMENTS

USE THESE CARDS

- **PRODUCT NEWS, PRODUCT BRIEFS:**

  Use first line of boxes. Insert item numbers of products on which more information is desired.

- **CATALOGS, BULLETINS AND ENGINEERING DATA:**

  Use second line of boxes. Insert item numbers of literature desired.

- **ADVERTISEMENTS:**

  Use third line of boxes. Insert page numbers of advertisements on which additional information is desired. Where more than one advertisement appears on the page, include the manufacturer's initials.

Please send me without obligation further information about the following: 3/59

Product News and Product Briefs, Item Number

Catalogs and Bulletins, Item Number

Advertisement on Page

NAME .....TITLE.....

COMPANY .....

ADDRESS .....

.....

ELECTRICAL CONSTRUCTION AND MAINTENANCE — A McGraw-Hill Publication

NOT GOOD AFTER MAY 1, 1959

Please send me without obligation further information about the following: 3/59

Product News and Product Briefs, Item Number

Catalogs and Bulletins, Item Number

Advertisement on Page

NAME .....TITLE.....

COMPANY .....

ADDRESS .....

.....

ELECTRICAL CONSTRUCTION AND MAINTENANCE — A McGraw-Hill Publication

NOT GOOD AFTER MAY 1, 1959

IMPORTANT...

- PLEASE PRINT LEGIBLY
- USE BLACK OR DARK BLUE INK
- DO NOT USE PENCIL OR RUBBER STAMP

Your Name and address will be reproduced and sent to the appropriate manufacturers. Illegible or incomplete addresses may result in your not receiving the information you desire.

PLACE 3¢
STAMP
HERE

The Editor
ELECTRICAL CONSTRUCTION AND MAINTENANCE
330 West 42nd St.,
New York 36, N. Y.

PLACE 3¢
STAMP
HERE

The Editor
ELECTRICAL CONSTRUCTION AND MAINTENANCE
330 West 42nd St.,
New York 36, N. Y.

Your Name and address will be reproduced and sent to the appropriate manufacturers. Illegible or incomplete addresses may result in your not receiving the information you desire.

FOR MORE INFORMATION ON

NEW PRODUCTS
CATALOGS, BULLETINS
ADVERTISEMENTS

USE THESE CARDS

- **PRODUCT NEWS, PRODUCT BRIEFS:**

  Use first line of boxes. Insert item numbers of products on which more information is desired.

- **CATALOGS, BULLETINS AND ENGINEERING DATA:**

  Use second line of boxes. Insert item numbers of literature desired.

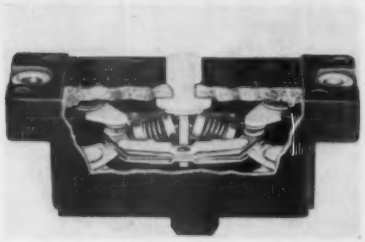
- **ADVERTISEMENTS:**

  Use third line of boxes. Insert page numbers of advertisements on which additional information is desired. Where more than one advertisement appears on the page, include the manufacturer's initials.

IMPORTANT...

- PLEASE PRINT LEGIBLY
- USE BLACK OR DARK BLUE INK
- DO NOT USE PENCIL OR RUBBER STAMP

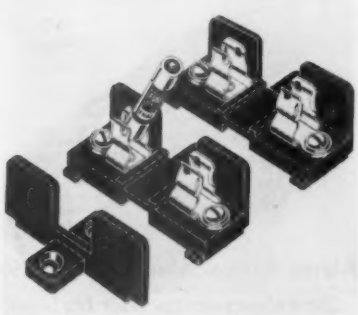
Product News



Limit Switches (1)

A new line of precision limit switches, designed for industrial applications. Small heavy duty switches incorporate a movable contact assembly utilizing two compressed coil springs to provide a quick make and break action. A leaf spring, carrying contacts, assures adequate contact pressure at all times. Contact carrier spring affords sufficient contact wipe to assure good electrical contact on low voltage. Completely enclosed in a semi-dust-tight molded phenolic case, the switch has an electrical rating of 600 volts. A wide variety of operators, such as plunger, roller and cabinet door types are available for use in combination with the basic switch. Publication EA-154 is available.

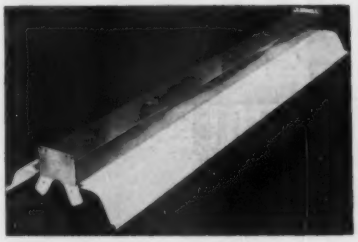
Cutler-Hammer Inc., 228 North 12th St., Milwaukee 1, Wis.



Fuse Blocks (2)

New Buss Add-On fuse blocks are designed to simplify protection of solenoids or small motors or control apparatus on multiple circuit equipment. Blocks may be assembled into a unit fuse block of one or any number of poles. Single pole blocks interlock by means of a boss that slips into a recess in bottom side of adjacent block. Each unit is firmly locked in place by a single screw. Additions may be made at either end of the assembly. Poles may be added or removed without necessity of disconnecting terminal leads on other units. Each fuse can be used as a circuit disconnect. Specially designed clips permit raising one end of fuse to a right angle position to the fuse block where it will be held firmly in place. Circuits can be numbered or otherwise identified.

Bussman Mfg. Div., McGraw-Edison Co., University at Jefferson, St. Louis 7, Mo.



Lighting Fixture (3)

A new industrial lighting fixture, known as the 6400 Unit, is equipped with two lamps and is a 40-watt unit. It has a rapid start UL ballast and is designed for chain, stem or surface mounting. Fixture has a baked enamel finish removable reflector.

Wheeler-Fullerton Lighting Div., Franklin Research Corp., 275 Congress St., Boston, Mass.

Electric Plant (4)

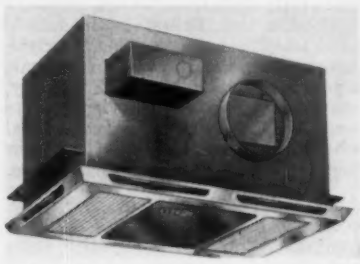
A new 2500-watt electric generating plant has been designed for portable and/or emergency standby. This gasoline engine-driven generator weighs 140 lbs and is for use as a heavy-duty power plant on a construction site or as a standby power for a home, business or small institution. Completely self-contained, the unit will provide ac power to run electric tools, lights and motors as well as operate essential household electrical equipment during emergencies. Both the portable and standby models deliver the same type of ac power—either straight 115-volt, straight 230-volt or combination 115/230-volt.

D. W. Onan & Sons, Inc., 2515 University Ave. S.E., Minneapolis 14, Minn.

PG Lamp (5)

A new, redesigned, improved Power Groove fluorescent lamp with 15% more light, 25% less weight, and only 7% more wattage will be available this spring to replace the present PG line. The "double-dimple" design has 3-in. grooves alternating on opposite sides of the tube to provide stronger construction, longer arc path and more light output. Lamp ends will not blacken, have push-pull socket base. Units will be interchangeable with original PG lamps. Initial production will be the 8-ft., 215-watt 15,000-lumen lamp with rated life of 7,500 hours. Complete line will include the 4-ft., 6-ft. and 8-ft. lamp.

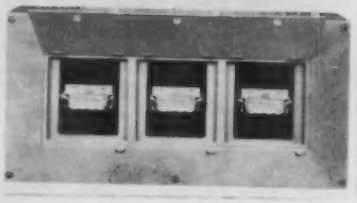
General Electric Company, Nela Park 12, Ohio.



Combination Unit (6)

A new combination unit ventilator-heater-light, Model 657C, designed with the Slim-Trim look. Some of the features are: chrome grille frame; 2-speed heater (high speed—both heater and ventilator switch on; normal speed—heater switch only); chrome heat reflector deflects all heat downward; aluminum honeycomb heater grille directs heat down; bimetal motor automatically closes positive damper control directing air over heating element. Automatic reset breaker.

Fasco Industries, Inc., North Union at Augusta, Rochester 2, N. Y.



Multiple Gang Units (7)

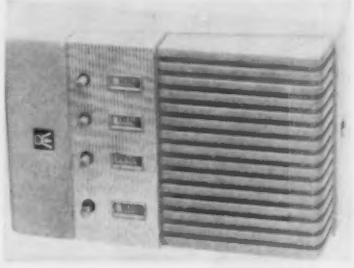
A new line of 100-amp multiple gang units suitable for multi-family use have 2-pole, 2-fuse and S/N pullout switches. Available in 2, 3, 4, 5 and 6 gangs. Individual door over each pullout has provision for padlocking or sealing. Combination knockout in top of box over each unit of 1¼-in., 1½-in. and 2-in. Pull-outs are on 7½-in. centers.

Frank Adam Electric Co., P. O. Box 357, Main P.O., St. Louis 66, Mo.

Lighting Fixture (8)

A new line of all-aluminum, surface mounting, exit lighting fixtures features interchangeable wiring for either incandescent or fluorescent lighting; bracket or pendant mounting; glow-in-dark glass, shock-resisting glass and stenciled metal fronts. All units are supplied with luminous bottoms. A folder is available.

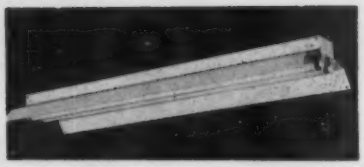
The Kirlin Company, 3435 E. Jefferson Ave., Detroit 7, Mich.



Alarm-Annunciator (9)

New alarm-annunciator for home, industrial fire alarm systems has been developed. Known as Dictograph AL-5, the single unit combines a loud, vibratory alarm with an annunciator, enabling the system to provide both auditory and visual fire detection. Visible bulls-eye lamps are incorporated into the unit. The combination, housed in a single unit, measures 7¼ by 4¾ by 2½ ins., is covered in a durable aluminum and Bakelite casing.

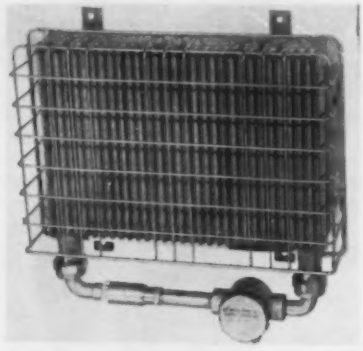
Fire Detective, Inc., 300 Chancellor Ave., Newark 12, N. J.



Lighting Unit (10)

A new industrial fluorescent luminaire, called the "Budgeteer", is a 2-lamp unit available for use with 4- or 8-ft standard rapid start, high output rapid start and slimline lamps, and a choice of UL or ETL approved ballast. Tandem units for 40-watt rapid start lamps also offer the same ballast selection. All units are Bonderized and finished in baked-on white enamel that provides over 85% reflectance. End plate connectors are designed for either individual or continuous row wiring, and each unit has provisions for chain, rod or surface mounting.

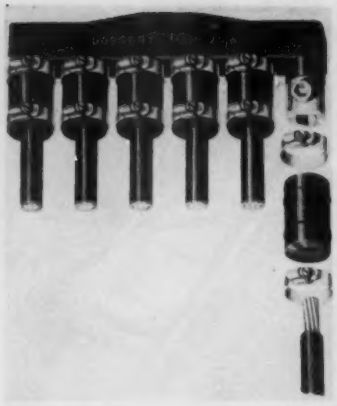
Westinghouse Lighting Division, Cleveland, Ohio.



Heater (11)

New explosion-proof electric panel heater has been approved by UL for use in certain specified hazardous areas. Model RX-5, 500-watt heater, may be used in Class 1, Group D, petroleum products, and in Class 1, Group C, Ethyl ether vapor, where temperature limit is 356°F. Model RX-10, 1000-watt heaters may be used in Class 1, Group D, petroleum products where temperature limit is 536°F. Heaters are suitable for either hot desert or low arctic temperature applications. Features include scientifically designed radiation fins of cast-aluminum which provide free flow of heated air. Hot resistor wires are insulated and embedded within finned aluminum casting. Special deflector channels force heat outward, providing secondary air flow. Literature is available.

Electromode Division of Commercial Controls Corp., 570 Culver Road, Rochester 3, N. Y.



Connector **(12)**

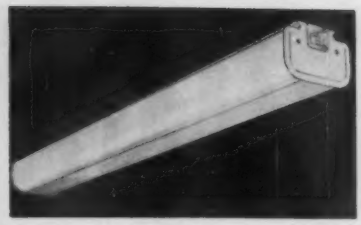
A new tapeless underground connector, called the Dossert Micon, is especially designed for residential and industrial distribution systems. It is fully insulated, joining up to eight electrical cables where watertightness must be insured. There are no extra components necessary to accommodate a wide range of cable sizes in any outlet position.

Dossert Manufacturing Corp., 249 *Huron St., Brooklyn, N. Y.*

Fittings **(13)**

An improved group of auxiliary fittings, designed for quick, easy installation of electrical distribution systems. The line includes a new "T" fitting as well as a 90° elbow and pull box, with angular sides. Other fittings include: 45°, 22½°, 7½° elbows, square pull boxes, junction boxes, nipples and telescope fittings for making odd-length connections and trough collars for adding flanges to cut wireways. Made of heavy code gauge steel, with a baked on gray enamel finish, the wireways are available in standard sizes of 2½- by 2½-in, 4- by 4-in, 6- by 6-in, 8- by 8-in, all in lengths from 1 to 5 ft. Flanges are provided at all ends of wireways and fittings, available with or without combination knockouts.

Keystone Manufacturing Co., 23328 *Sherwood Rd., Warren, Mich.*



Fluorcescent Unit (14)

A new line of commercial fluorescent units, designated as the B_2 utility line, will be used primarily for economy lighting in retail stores. It uses a modern polystyrene diffuser that completely encloses the lamps. Booklet is available.

Benjamin Electric Manufacturing Co., Northwest Highway, Des Plaines, Ill.

Bedroom Light (15)

A new bedroom light, designed especially for hospital rooms, provides lighting from both indirect and direct sources. Unit is mounted on the wall behind the patients' bed. Soft fluorescent lamps and incandescent night lights are installed in the 10-ft trough. Incandescent bed lights with 75-watt lamps are mounted over each bed, within easy reach for a patient to move its adjustable arm to a comfortable reading position.

Simes Company, Inc., 114-15 15*th Ave., College Point* 56, *N. Y.*

Hoist (16)

A new improved model of the Hi-Hoist includes a universal cradle with three sets of adapters that make the unit adaptable to almost any lifting and holding job. Unit is used by electrical contractors to lift and hold fluorescent lighting fixtures in place so that one man can make the installation. One set of adapters has a 6-in. spread, the second set an 18-in. spread, and the third set is "V" shaped for holding pipe and other cylindrical objects.

It can lift materials weighing up to 100 lbs, and hoists to a height of 13 ft. The telescoping lift mechanism is controlled by a non-slip, cable drum crank operation. Unit rolls on 3-in. casters. It disassembles into three sections and can be carried from job to job in a pick-up truck or trunk of a car.

Lantz Manufacturing Co., Inc., Valparaiso, Ind.

Fittings **(17)**

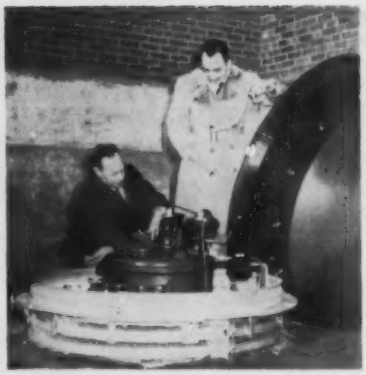
Service entrance cable head for 100-amp service installation has been designed for easy wiring with plenty of "turn radius." Made of non-rusting, non-corroding aluminum. Lid fastens in place with one pressure screw. Split insulator assures easier wiring. UL and CSA approved.

Killark Electric Mfg. Co., Vandeventer and Easton, St. Louis 13, *Mo.*

Controller **(18)**

A new twistlock photoelectric street lighting controller and a new photoelectric luminaire hood are now available. Both units meet NEMA and EEI proposed standards. Use of a Thyrite element for protection against surges induced by lighting or line crossovers is a key feature of the unit. Printed circuit construction allows visual tracing of circuits. Controller is 4 ins. high and 3½ ins. in dia. Photoelectric hood is made of die-cast aluminum and is equipped with a die-cast aluminum slipfitter, and a locking-type receptacle for the controller, and internal binding posts for wiring through the bracket. It is designed for use with 5⅜-in. and 7-in. light-center-length mogul base lamps in standard Type A reflectors, and for use with 5¼-in. and 4⅜-in. light-center-length medium base lamps in Type B reflectors.

General Electric Co., Schenectady 5, *N. Y.*



Transformer Enclosure (19)

Semi-buried transformer enclosures for underground distribution systems are now available in a "package" complete with transformer and two enclosed disconnects. Only item not included in the package is the 48-in. corrugated steel culvert pipe. Enclosure consists of a heavy-gauge steel cover section to be hinged to the culvert pipe. All hardware, including hasp for padlocking, is included. The top of cover dome projects 33 ins. above grade. Enclosure will accommodate standard pole-type transformers through 167 kva, and two standard enclosed disconnects.

General Electric Co., Schenectady 5, N. Y.

Floodlight (20)

A new aluminum 24-in. diameter enclosed floodlight for 700-1000-watt mercury vapor lamps. Furnished in five mounting arrangements and known as Series 2400, this new group of floodlights includes thermal shock and impact resistant lens, stainless steel lens ring and hinge and stainless steel clips. Gasketing makes each unit weatherproof. Mounting brackets include yoke only for fixed wall mounting, crossarm, pipe clamp, adjustable wall and pole top fitter units.

Steber Manufacturing Co., Broadview, Ill.

Recloser (21)

An improved, 150-kv BIL single-phase recloser having increased interrupting ratings is now available. Designated Type E, this recloser is intended for use on distribution circuits having phase-to-phase voltages of 2.4 to 23 kv, fault currents up to 2500 symmetrical amperes, and load currents ranging from 5 to 100 amps. Three reclosers can be electrically interlocked to provide 3-phase lockout when any recloser locks open. Two, three, or four operations to lockout on any one of three characteristic curves can be easily set in the field.

Line Material Industries, McGraw-Edison Co., Milwaukee 1, Wis.

Ballasts (22)

New indoor mercury lamp ballasts that operate in ambients up to 150°F are specifically designed for locations such as steel mills, foundries and press rooms. Available in 115, 230, and 277-volt models. All have brackets for wall mounting and pry-outs which permit pendant mounting.

Jefferson Electric Co., Bellwood, Ill.

Power Supply (23)

A new dual output 12 kw dc power supply for industrial applications and research programs provides two outputs of 0-60 volts at 200 amps simultaneously and is controlled by a motor driven powerstat. The two 12 kw sections are arranged to permit either connection in series to provide a single dc output of 0-120 volts at 200 amps or connection in parallel to provide 0-60 volts at 400 amps. Unit has an ac input of 460 volts, 3-phase, 60-cycle per second. Rectifier unit is provided in an upright steel cabinet incorporating the entire two dc outputs. It is mounted on casters.

Perkin Engineering Corp., 345 Kansas St., El Segundo, Calif.

Exhausters **(24)**

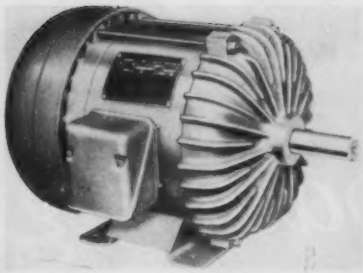
A new line of centrifugal wall exhausters are constructed of heavy gauge aluminum, and are for installation in schools, hospitals, laboratories or any sidewall ventilating system. Features are: rubber-mounted ball-bearing motors of standard NEMA design; spun aluminum housings; airfoil contoured wheel blades; wire mesh bird screening; external conduit arrangement; disconnect switches standard on belt drive units are also available for most drive units; automatic back draft dampers; Epoxy resin coating. Catalog sheets are available.

Power Line Fan Company, Plainfield, N. J.

Indicator **(25)**

A new multi-switch indicator, Series 9000, is available with switching details that allow the instrument to be used for as many as 108 stations. Additional stations may be added by the use of an additional switch housing cabinet. Basic instrument is completely self contained, null-balance unit and requires only external sensing devices. Selector switches are three position spring return type with DPDT action. Indicator uses an 11-in. scale either single or dual range. Standard reference system is a constant voltage source with standard cell and battery being optional.

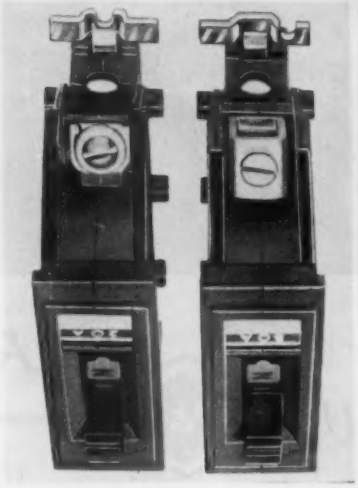
Wheelco Instruments Div., Barber-Colman Co., Rockford, Ill.



Motors **(26)**

A new line of single phase motors in totally-enclosed fan-cooled and UL approved explosion-proof frames. Available in 2-, 4- and 6-pole speeds, motors are built in re-rated NEMA frames 182, 184, 213 and 215. Ratings range from ¾ to 5 hp. Condensers and centrifugal mechanism are completely enclosed within the front end head. Motors are designed for installation in damp areas, dusty or corrosive atmospheres and out-of-doors. Metal parts are protected with special rust and corrosion resisting coatings.

Robbins & Myers, Inc., Motor Div., Springfield, Ohio.

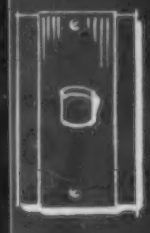


Circuit Breakers **(27)**

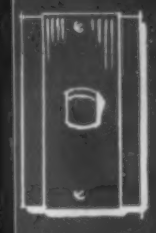
New non-interchangeable circuit breakers have been announced. The non-interchangeable breakers are installed and removed in the same manner as the interchangeable type. Breakers are divided into two classifications—First 0 to 20-amp, single pole, 0 to 20-amp, double pole; second 21 to 50-amp, single pole and 21 to 50-amp, double pole. The non-interchangeable enclosures are equipped with breaker support channels, which are punched and coded for custom blocking by the installing electricians. UL listed.

Wadsworth Electric Mfg. Co., Inc., Covington, Ky.

PUSH IT



ROCK IT



ROLL IT

PRESS IT

introducing

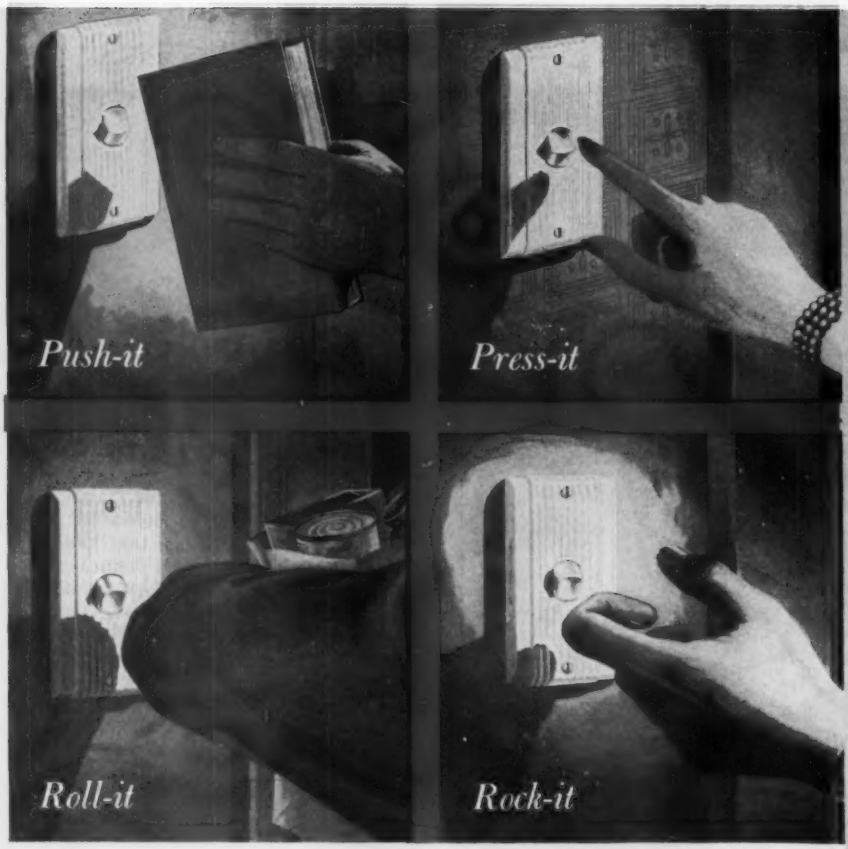
the new P&S **ROCKER-GLO SWITCH**

the beauty . . . the design . . . the performance you've hoped for in one switch

After intensive testing, Pass & Seymour proudly presents ROCKER-GLO . . . the *one* switch that answers all your needs.

A switch that is trouble-free and packed with eye-appeal.

ROCKER-GLO does the job of *all* types of switches. It combines toggle action *and* press action with luminous and quiet features that answer all individual customer needs.



ROCKER-GLO
SWITCH

the switch that obeys every touch!

PUSH IT
ROCK IT
ROLL IT
PRESS IT

. . . no matter how you operate *ROCKER-GLO*, you'll find the merest brush or flick provides smooth-as-satin rocker action... *and ROCKER-GLO glows in the dark!*

Check these features:

- Whisper-quiet
- Glows in the dark
- Dependable instant action
- Engineered to eliminate call-backs
- Perfect for any decor
- Easily installed

ROCKER-GLO SPECIFICATIONS

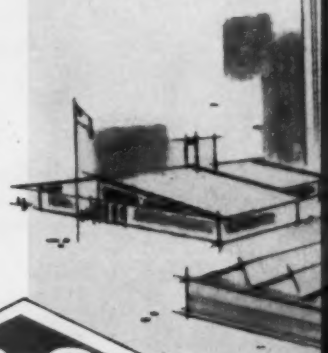
Available as follows:

- Despard Type with Strap
- Despard Type, Interchangeable
- Narrow Rocker for Tumbler Switch Plate (the ideal replacement switch)
- Single, Double Pole, Three way or Four Way
- 15 or 20 Amps, 120/277 Volts A.C.
- Easy-to-Wire Pressure or Screw Terminals
- In One Color Only — Luminous Ivory

Watch for your P&S salesman with your FREE sample or write and have him stop to show you the new Rocker-Glo.

SPECIFICATION GRADE

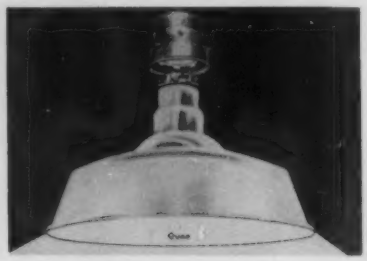
ROCKER-GLO . . . the switch that LOOKS RIGHT . . . FEELS RIGHT . . . and IS RIGHT for every type of wiring job.



Dept. ECM-359.

Pass & Seymour, Inc.,
Syracuse 9, New York
60 E. 42nd St., New York 17, N. Y.
1440 N. Pulaski Rd., Chicago 51, Ill.
In Canada: Renfrew Electric Limited, Renfrew, Ontario

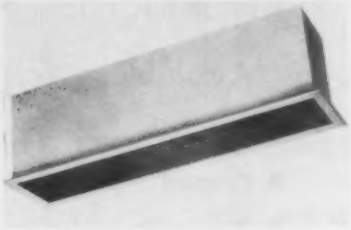
P&S



Lamp Holder Assembly (28)

The Quad Easy-Tach terminal base and detachable reflector enables one to interchange or remove reflectors wherever desirable. By having an extra reflector lamp holder assembly you can replace the "in-service" unit with one that has already been serviced. To connect, push the pronged socket into the cast hood, then turn clockwise. To disconnect, grasp the reflector lightly and turn counter-clockwise. The hood has a spring-action that permits snap-on and snap-off of any Quad socket type reflector. Disconnect sockets are available with nine different standard reflector designs. Five are RLM. Units can be obtained with mogul or medium sockets.

Quadrangle Manufacturing Co., 32 South Peoria St., Chicago 7, Ill.



Heaters (29)

Electric floor insert heaters are desirable where floor-to-ceiling window areas make the electrical baseboard installation impractical. New engineering features give an effective blanket of heat directly in front of floor-to-ceiling windows. Automatic safety cut-off in the event a rug, newspaper, magazine or drape covers the heater. Unit has hermetically sealed-air tight element. Housing fabricated of 20-gauge electro-galvanized steel. Floor insert heater fits through subflooring, mounted between or parallel to joists. Models range from No. FH 350, 1194 Btu's, 14 in. wide, 9½ ins. high, 6-ins. deep. No. FH 750, 2559 Btu's, 30 ins. wide, 9½ ins. high, 6 ins. deep. Each controlled by 2-wire, single line break thermostats.

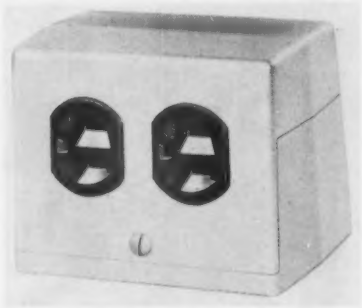
Electrovector, Inc., 475 Flushing Ave., Brooklyn 5, N. Y.

1440 N. Pulaski Rd., Chicago 51, Ill.
In Canada: Renfrew Electric Limited, Renfrew, Ontario

Mercury Vapor Lights (30)

Reflector Type Circle-D mercury vapor lights for industrial and commercial lighting. Units are available for standard and high bay services, in flood, spot or color corrected Merco-White. Lamps are made in 250, 400, 700 and 1000 watts, standard and high volts. Heavy cast aluminum housing. A spring mounted mogul socket supports and cushions shocks at the base, while globe is centered and supported by a silicone rubber ring gasket. A new feature is calibrated stanchion connector bracket permitting pre-setting light beam pattern before installation. They are for indoor and outdoor use.

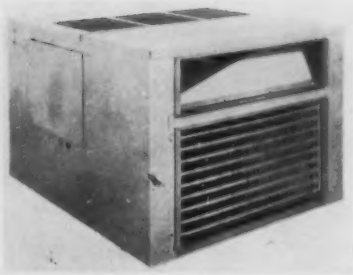
Natale Machine and Tool Co., 339 Highway 17, Carlstadt, N. J.



Fittings (31)

New Spang receptacle service fittings and telephone service fittings for use with underfloor electrical raceways. Sloping back and face plates, each held by a single captive screw, meet at the top center to enclose the fittings and give access to entire enclosed space when removed. From one to four power receptacles can be accommodated. Fittings take all standard power receptacles including 50-amp rating. For telephone service a special bracket is used to hold terminal blocks in place.

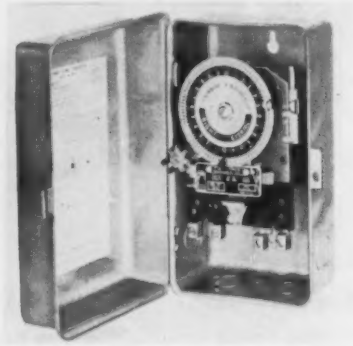
National Supply Company, Two Gateway Center, Pittsburgh 22, Pa.



Heat Pump **(32)**

A new 2 hp heat pump designed for small homes and multi-unit structures has been introduced. The Weathermaker is a one-piece unit for whole house air conditioning. Its cabinet is less than 3 ft sq and can be located outside the house for installation and service. Unit has a cooling capacity of 22,000 Btu and heating output of 23,000 Btu with additional strip heaters available at 10,000 Btu each. Automatic defrosting is actuated every 90 minutes if necessary. Operation starts only if outdoor temperature is in the range where frost will form. Besides a room thermostat which automatically switches the unit from heating to cooling as required, the heat pump has an Econostat located outside to actuate strip heaters when temperatures fall below certain levels. This prevents the main system from operating each time the unit demands heat.

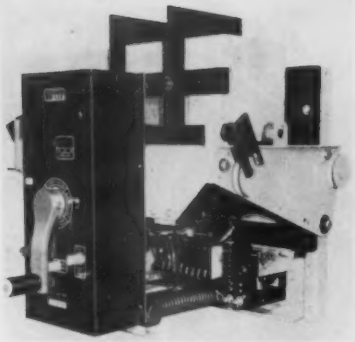
Carrier Corp., Syracuse 1, N. Y.



Time Switch **(33)**

A new two-circuit time switch for multiple control building and parking lot lighting is now available in the standard line. Model 1196 contains two sets of single-pole single-throw contacts. The two-circuit switch will turn two lighting circuits on at one time, and turn them off independently. The 1196 is also available with Tork's new Reserve Power.

Tork Time Controls, Inc., Mount Vernon, N. Y.



Circuit Breaker (34)

A new low voltage power circuit breaker, the LA-75A, rated at 75,000 amps interrupting capacity at 2000 and 3000 amps current carrying capacity has been introduced. Breaker provides both electrically and manually charged stored energy closing mechanisms on each unit. Positive closing is insured by the Amplitork stored energy closing mechanism. A fhp motor operated from either dc or ac provides energy to compress closing springs. All conducting parts of breaker are mounted on a single-piece base support for maintenance. Racking mechanism and breaker contacts are positively interlocked to prevent withdrawal of a closed breaker. Once disconnected, breaker can rack out freely on its rollers. The LA-75A breaker is available as a separate unit for panelboards, framework mounting or for individually enclosed mountings in switchgear cubicles.

Allis - Chalmers Manufacturing Co., Milwaukee 1, Wis.

Cable (35)

A new intercommunication cable with color-coded paired copper conductors in size No. 22 Awg, is designed for use in intercom, annunciator, telephone, and call systems in hospitals, schools, office buildings, industrial plants, and similar applications. Available in conductor pairs of 6, 11, 16, 26 and 51. Insulation is Flamenol (polyvinyl chloride) which provides permanent, solid color-coding so that each pair can be identified and selected from all other pairs in the cable. Over-all jacket is a Flamenol which permits normal stapling of cable to walls or baseboards without damage to cable. Stripping is made easy by use of a nylon rip cord under the jacket. Data sheet is available.

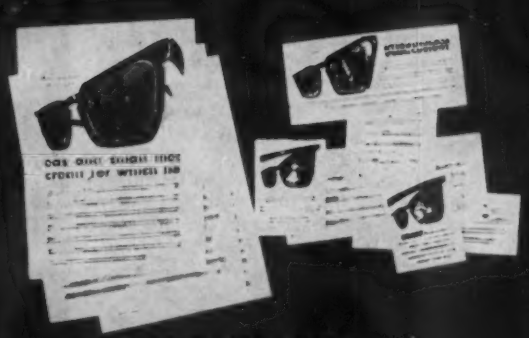
General Electric Co., Wire and Cable Department, Bridgeport 2, Conn.

APPLIANCE SWITCHES • WIRING DEVICES

CONSUMER ADS to pinpoint the need for Eye-Fi Relighting in the trade publications of each major market.

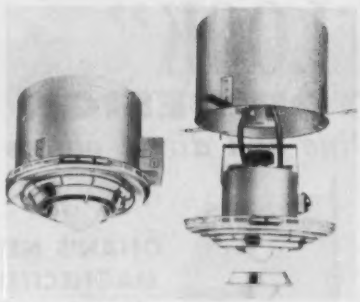
NATIONAL ADS in large-circulation, high-influence magazines, to launch the Eye-Fi program with power and prestige.

COUPON ADS to produce inquiries and leads, offering hard-selling and informative brochure through economical small space.



PROMOTIONAL AIDS designed for use by local groups, including self-mailers, ad mats, envelope stuffers, etc.

PLUS publicity, prepared talks and slides, training programs, inter-industry information, sales aids and other materials to round out and complete the Eye-Fi Relighting promotion program.



Heat and Light Unit (36)

A new bathroom ceiling built-in Heetaire-Lite unit produces instant radiant infra-red heat plus lighting. Unit has a sheathed stove-type heating element with a special nickel chromium alloy sheath that arrests moisture action. Using a 100-watt bulb, it has a snap-on-off glass for relamping. Housing fits between standard 16-in. joist centers, heating elements suspended. All ceiling units may be used with wall thermostats for automatic control. Literature is available.

Markel Electric Products, Inc. and La Salle Products, Inc., Buffalo, N. Y.

Generator (37)

A new model, M-2500-P, electric generator has an output of 2500 watts and weighs 157 lbs. Unit features: recoil starting, duplex and twistlock receptacles, pilot light, a carrying frame and special shock pads. Literature is available.

Pioneer Gen-E-Motor Corp., 5841-49 *W. Dickens Ave., Chicago* 39, *Ill.*

Magnetic Controls (38)

The new Class 41 contactor line rated in 20-, 30- and 40-amp sizes for air conditioning and refrigeration are also rated through 10 hp, 220 volts and 15 hp, 550 volts polyphase for across-the-line control of electric motors, heating and lighting loads. These same controls are also rated for resistance heating loads through 40 amps. The 20-, 30- and 40-amp sizes in 2-, 3- and 4-pole devices have the same mounting dimensions. Contactors can be furnished to mount in any position. One-piece molded frame and arc box provides a self-insulating base which is resistant to tracking and moisture. Molded magnet coils are moisture resistant. Contacts are visible. General purpose Type 1 enclosures are treated to resist corrosion. Bulletins 41-B1 and 41-B2 are available.

Furnas Electric Co., 1067 *McKee St., Batavia, Ill.*

Lighting Fixtures (39)

A new series of "Spiralite" lighting fixtures uses polished brass with concentric circles impressed around the shade. Shades are perforated. Series includes a pole lamp, a 3-light cluster, a pulldown, a close-to-ceiling unit and single pendant.

Thomas Industries Inc., 410 *South Third St., Louisville* 2, *Ky.*

Intercom Phones (40)

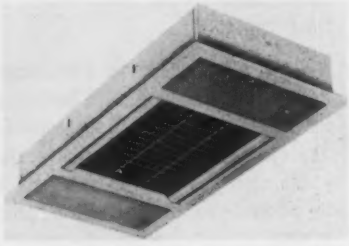
Deluxe executive intercom phones, the new Fanon-Fone Series 5000, now provides for as many separate simultaneous conversations as there are pairs of call buttons on the face of the desk-type phone. It also features a paging system and facilities for multiple-station conference calls. In order to contact another station, the caller merely presses the appropriate call-button. When the hand-set is replaced, all engaged buttons are automatically released and cleared. Two models are available—Model 5006 contains six buttons on face of phone and has a 7-station capacity. Three simultaneous private conversations or conference calls are permitted. Model 5012 contains 12 buttons and accommodates 13 stations, permitting six simultaneous private conversations or conference calls.

Fanon Electric Co., Inc., 98 *Berriman St., Brooklyn* 8, *N. Y.*

Lighting Fixture **(41)**

Series "H" explosion-proof light fixture has been designed to provide maximum light while providing easy installation and maintenance. Unit is available in various mounting arrangements and with a choice of reflector styles. Sizes range from 60- through 500-watt units. All are approved for Class I, C & D; Class II, Group E, F and G.

Killark Electric Mfg. Co., Vandevanter and Easton, St. Louis, 13, Mo.



Heater/Lighting Unit **(42)**

A recessed ceiling unit combining electric radiant heating with built-in lighting, named Pyrolite-RCL, has been announced. Rated at 1,000 watts of heating, the unit is mildly fan-forced to circulate convection heat normally stacked at the ceiling to all corners of the room. Tempered Pyrex glass panels have an electrical conductive coating. Carbon-contact bus bar assures electrical contact. The 200 watts of lighting banked on either side of heating panel uses Corning's "Alba-Lite". Heating is controlled by a wall-mounted thermostat, lighting by a separate wall switch. Units are UL approved, available in 120-, 208- and 240-volt. Dimensions are 13¾ ins. by 27 ins. outside, 12 ins. by 26 ins. by 6¾ ins. inside, including junction box. External frame is available in either a polished chrome or baked white enamel finish.

Berko Electric Mfg. Corp., 212-40 Jamaica Ave., Queens Village 28, N. Y.

HOW CBM ASSURES YOU BETTER BALLAST VALUE

ETL checks 12 to 14 specified ballast characteristics on all Certified types in production by each manufacturer, verifies compliance by test . . . and does it every month!

THIS is important: Because if any ballast fails to measure up, the right to carry the emblem "Certified CBM by ETL" is withdrawn.

What characteristics are checked? The operating qualities which the American Standards Association has determined will give dependable, rated performance from the lamps with which the ballasts are designed to be used. These constitute the CBM Specification and assure:

High power factor • High light output • Positive starting • Rated lamp life • Limit on heat rise • Control for steady light • Quiet operation

From these qualities come practical benefits: Up to 2,500 hours more lamp life than with ordinary ballasts; as much as 40% more light output; and savings on installation . . . with less wire, fewer circuits needed for fixtures CBM equipped . . . fewer fixtures for the same level of light.

For the latest facts on why it pays to specify fixtures equipped with Certified CBM Ballasts, ask us to send you CBM NEWS.

CBM CERTIFIED by ETL

CERTIFIED BALLAST MANUFACTURERS

2118 KEITH BUILDING
CLEVELAND 15, OHIO

Participation in CBM is open to any manufacturer who wishes to qualify

2-59

Tool **(43)**

A new radiant heat tacker, Model T5-8W, designed especially for installation of radiant heat cable and low-voltage wiring, such as intercom systems and inside telephone wiring. A built-in wire guide, special ⅛-in. leg length staples with shaped crowns and ground-out driver. A built-in wire guide automatically centers the tacker over the cable. Crown of this staple is shaped to fit snugly over the wire without damaging the insulation.

Bostitch, 2008 Briggs Drive, East Greenwich, R. I.

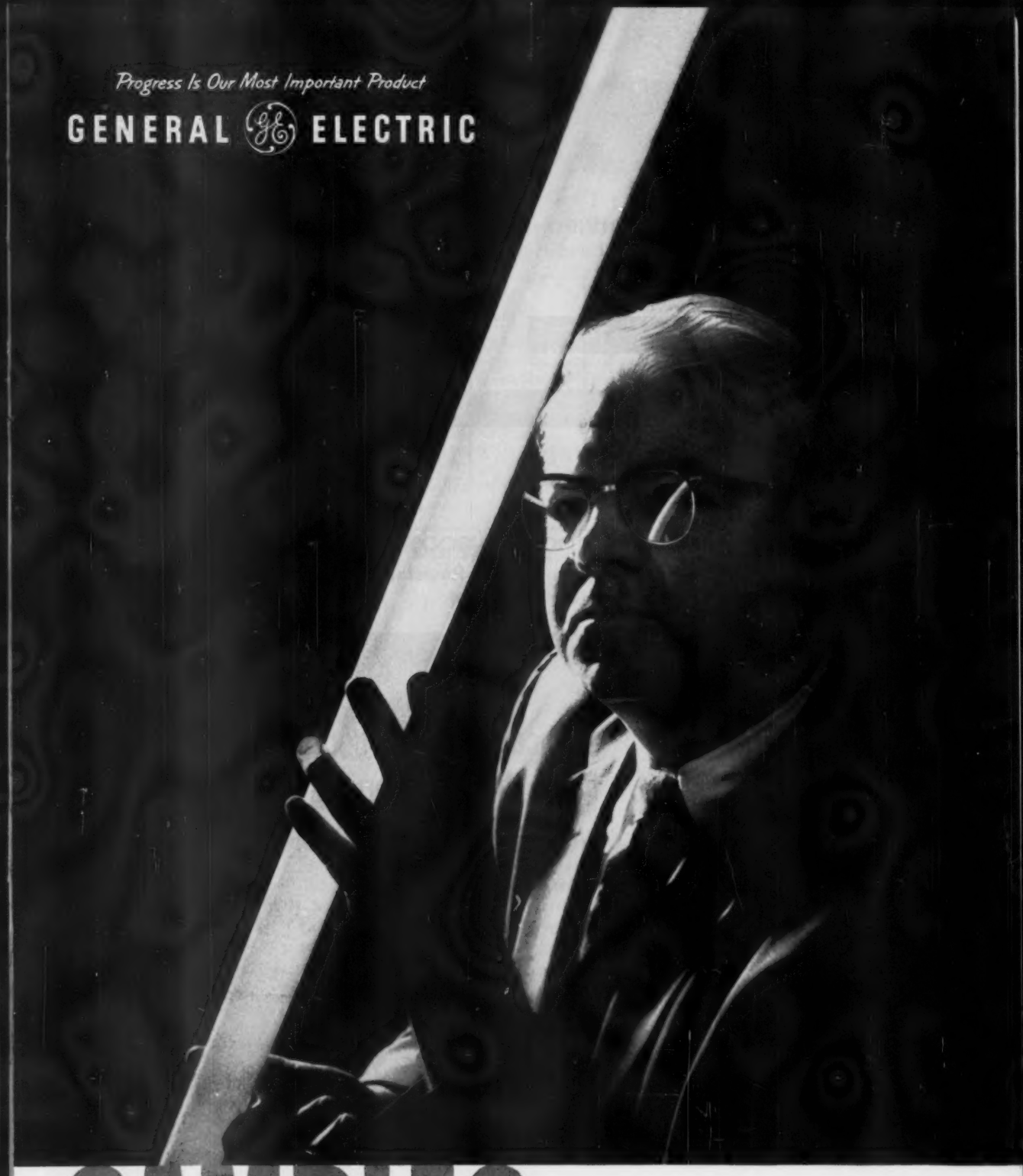
Action Light **(44)**

An improved action light for outside applications, designated Model 28S. The light consists of a 100-watt lamp, with a motorized nontarnishing Alzak reflector weatherproof housed in a transparent cylinder. The motorized reflector rotates around the lamp to create 60 impulses a minute. Steel housing is available in chrome plate finish or baked hammertone enamel. Transparent cylinder is furnished clear, or with blue, amber or red color. Rubber gaskets provide weatherproof seals between housing and cylinder. A ½-in. pipe nipple facilitates mounting and weatherproof enclosed wiring. Overall dimensions are 6¼ ins. dia, 15 ins. high. Furnished for 115 volts, 60 cycles, ac. Literature is available.

North American Signal Co., 220 H. South State Street, Chicago 4, Illinois.

Progress Is Our Most Important Product

GENERAL ELECTRIC

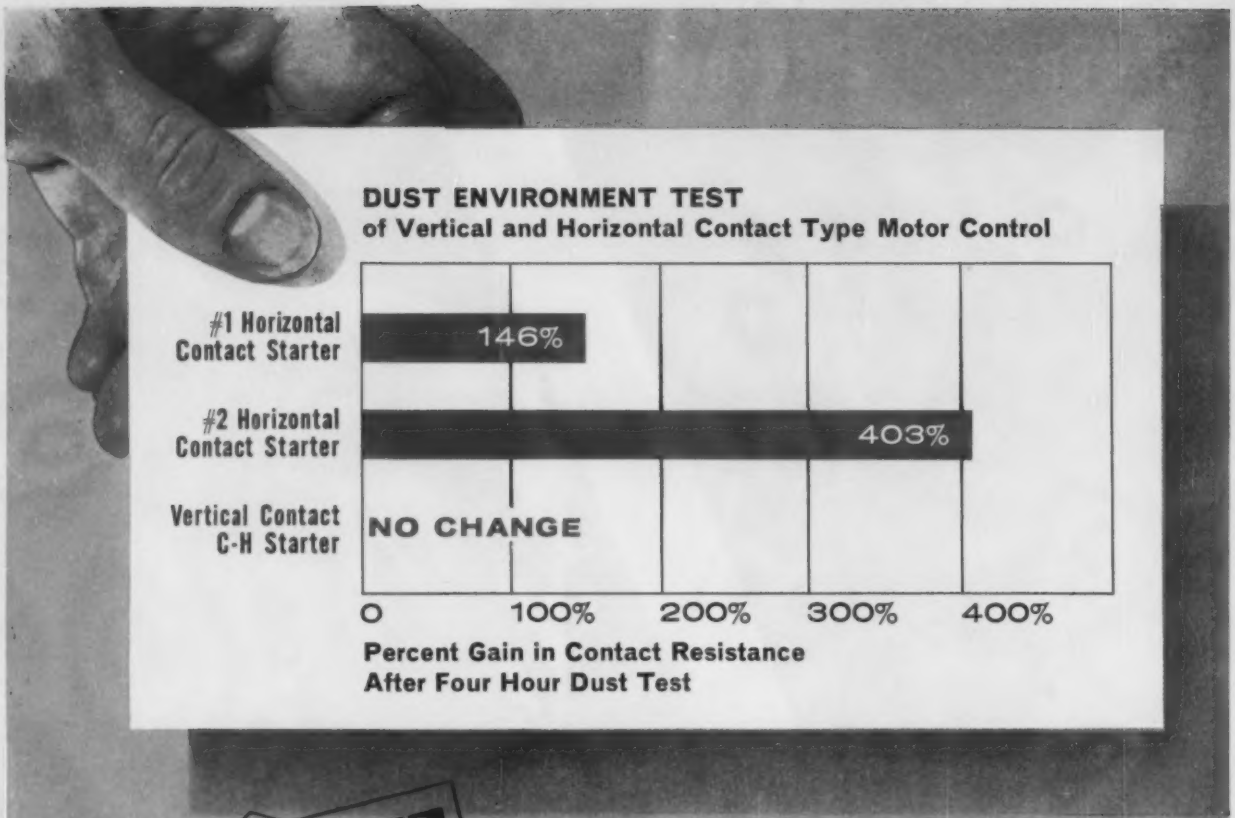


GAMBLE?

"I think I'm about average . . . as P. A.'s go. Regular hours . . . about 10 a day. Occasionally a product comes along that makes my decision easy—like G-E Lamps. Odds are 999 out of 1,000 are sure-starters . . . 99 out of 100 will last about 2 years. And our fluorescent per-case price is less than in 1950!"

GAMBLE? "Why gamble on lamp performance when, on the average, 999 out of 1,000 G-E Lamps are free of any defect which could affect performance in our sockets!"

General Electric Co., Large Lamp Dept. C-907, Nela Park, Cleveland 12, O.



PROOF OF PERFORMANCE

Vertical *dust-safe* contacts keep Cutler-Hammer Three-Star Motor Control working better...working longer

Standard dust chamber used to compare performance of vertical and horizontal contact type motor starters in dust environments

"Dust can't collect on a vertical surface." This is a simple fact, but an important one to users of motor control. To function properly the contacts in motor control *must* stay clean, free from all forms of dust under all operating conditions. And because dust can't collect on a vertical surface, only vertical contacts are truly *dust-safe*. For proof look at the results of this test.

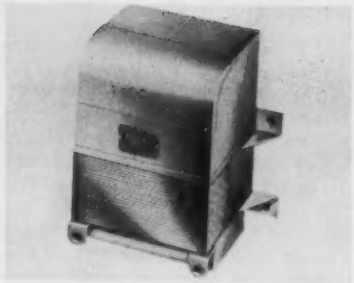
Both horizontal and vertical contact type motor starters were subjected to a dust environment for four hours. The vertical contacts proved their immunity to dust by maintaining a constant contact resistance. But the contact resistance of horizontal contacts skyrocketed, and as contact resistance increases so does heating, pitting and wear, resulting in rapid contact failure.

These are the facts . . . facts which show you why it's wise to standardize on Cutler-Hammer Three-Star Motor Control with vertical *dust-safe* contacts.

CUTLER-HAMMER

Cutler-Hammer Inc., Milwaukee, Wis. • Division: Airborne Instruments Laboratory. • Subsidiary: Cutler-Hammer International, C. A.
Associates: Canadian Cutler-Hammer, Ltd.; Cutler-Hammer Mexicana, S. A.; Intercontinental Electronics Corporation.

CUTLER-HAMMER CONTROL C-H



Transformers (45)

A new and complete line of buck and boost transformers. There are 20 models available, covering 480 voltage transformations. All models have a dual rated primary, 120/240-volt, with a 12/24-volt or 16/32-volt secondary. Literature is available.

Jefferson Electric Co., Bellwood, Ill.

High Voltage Fuse (46)

A new universal current limiting fuse, marketed as the S&C Fusistor, will take care of most indoor potential transformer needs at 14.4 kv and below. Unit is designed to fit all mountings. Current limiting section of fuse is a helically coiled molybdenum wire, in turn helically coiled on a ceramic core, embedded in silica sand. Unit provides immediate response to a fault with longer current limiting action and less pronounced "chopping" of the current when wire melts. Interrupting section is boric acid chamber. Both sections combine on heavier faults to limit and interrupt current providing protection over full range of fault currents. Fusistor is available in four voltage ratings—4.8, 7.2, 13.8, and 14.4 kv, and two clip center sizes—8½ ins. and 11½ ins.

S & C Electric Company, 4435 Ravenswood Ave., Chicago 40, Ill.

Tool (47)

A skinning knife, known as No. 74 Poly-knife, to cut, peel, and strip off neoprene and polyethylene coatings from wire and cable. Also designed to handle aluminum conductors 2/0 to 4/0 flat service wire. Works equally well for both center splices and conductor ends. Knife blade completely shielded. After splitting insulation, the outside guide will slip under insulation and peel or roll off the material with a twist of the wrist.

Miller Equipment Co., Inc., Franklin, Pa.

Switches (48)

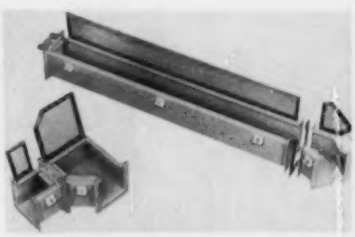
A full line of load break oil switches for load centers, unit substations and other outdoor and indoor power distribution needs. Available in standard designs of 2-, 3- or 4-way, 3-pole, in 7.5 and 15 kv, 400-amp ratings. Tanks are of ¼-in. welded steel, pressure tested. All component parts are of standard design, interchangeable within like ratings, and include provision for padlocking, key and electrical interlocking. Catalog is available.

ESCO Manufacturing Co., P. O. Box 1039, Greenville, Texas.

Rectifiers (49)

Silicon ac to dc power rectifiers are available. The SN-60 series, designed for intermediate power applications, is an efficient rectification medium with good electrical and mechanical characteristics. Low maximum forward voltage drop is 1.2 volts at 10 amps, 27° C. Diodes are of all-weld construction, hermetically sealed to withstand severe service. Diodes are available with flat or stud bases, with flexible or rigid positive connections. Literature is available.

Syntron Co., 690 Lexington Ave., Homer City, Pa.



Wireway and Fittings (50)

Oil tight, lay-in wireway and fittings are designed to house electrical wires and are made to JIC standards. The ends of each straight section or fitting are flanged on three sides; a neoprene gasket is placed between the end flanges when pieces are bolted together. After wires have been laid in, a gasketed sealing plate is screwed tightly in place at the top of each joint to provide complete sealing between pieces. Standard wireway sizes are 2½ by 2½ ins., 4 by 4 ins., 6 by 6 ins., and 6 by 12 ins. Straight sections measure from 6 ins. to 10 ft. Auxiliary fittings include elbows, crosses, "T's", etc.

Hoffman Engineering Corp., Anoka, Minn.

Ballasts (51)

A new line of mercury ballasts for operation with mercury lamps ranging from 100 to 425 watts is now available. The line includes regulator ballasts for use with 100-, 175-, 250- and 400-watt lamps; and reactor ballasts for use with 175-, 250-, 400-, and 425-watt lamps. Called the "Bonus Line", the new units are designed to provide higher operating efficiency and improved regulation in a smaller, lightweight design. New core and coil design of units protects against lamp current or wattage increases even with changes of 10% or more in the primary voltage and provides plus 0 to minus 1.5% regulation. Especially designed for outdoor use, the ballasts are not affected by low temperatures.

General Electric Co., Schenectady 5, N. Y.

Lighting Control (52)

A new lighting control line designed for installations requiring the simplest form of lamp intensity control. Designed for incandescent or 40-watt T-12 fluorescent lamp control, new units use Varistat or Radiastat adjustable autotransformer dimmers in open type assemblies or enclosed in sheet metal enclosures furnished in gray. Sizes range from 1200 watts to 24,000 watts per assembly. Operation is manual by means of molded handwheels or slot closing levers.

Ward Leonard Electric Co., Mount Vernon, N. Y.

Heating System (53)

A decorator-styled electric home heating system that keeps both floors and window areas warm. The system consists of electric panels framed in aluminum and finished with wood-grained, beige-tone, or marbleized plastic to blend with room decor and furnishings They can be used for new construction or added to present homes. Each panel is a self-contained heating unit, 2¾ ins. deep, designed to be mounted on walls beneath window areas. Panels come in five sizes. The panels provide 50% radiant heat and 50% convected heat. They can be used as baseboard heaters. wall panels or as ceiling panels. Each room is provided with its own thermostat. Panels are available for 120 and 240 volts, and in wattages ranging from 375 to 2,000. Sizes are 36 by 18 ins., 48 by 6 ins., 36 by 9 ins, 36 by 14 ins., and 72 by 9 ins.

Sun-Tron Corp., 7435 West Wilson Ave., Chicago 31, Ill.

Ballast (54)

A new fluorescent dimming ballast, designated as type B1013, which was designed for use with Luxtrol light controls, has a range of maximum to minimum illumination in a ratio of 500 to 1. All lights come on at the same time. Lighting set by Luxtrol at a desired level of illumination before being turned off may be turned on at the same level without adjusting.

Superior Electric Company, Bristol, Conn.

Product Briefs

(55) **Aluminum magnet wire** in a broad range of sizes, shapes and insulations is now being made available by Kaiser Aluminum & Chemical Sales, Inc., Chicago, Ill.

(56) Albertson & Company, Inc., Sioux City, Iowa, has added five new models to its line of electric **impact wrenches** and electric **screwdrivers**. . . . (57) A footage **meter** is now available for measuring various lengths of electrical wire and cable, including lead-coated and flexible conduit, in sizes ranging from ⅛ to 1¾-in. in dia. It will also measure wire rope, hose and plastic flexible pipe. Manufacturer is Reel-O-Matic Div., Columbia Products, Inc., Wrightsville, Pa. . . . (58) Progress Manufacturing Co., Inc., Philadelphia, Pa., has fitted their outdoor posts and lanterns with **outlets.**

(59) The Ess Instrument Company, Bergenfield, N. J., has developed miniaturized **"electric eyes"** for industry. They can be used to operate a relay when a direct light beam is cut by a passing object or to operate on light reflected from a surface. . . . (60) An **overload protector** for fhp motors which trips in response to either rising temperature of the motor or excessive current draw has been introduced by Mechanical Products, Inc. of Jackson, Mich. . . . (61) The Joyce-Cridland Company, Dayton, Ohio, has redesigned its **air motor jack.**

(62) The RES-TEP **safety step** offered by Utility Tool and Body Co., Clintonville, Wis., consists of a one-piece aluminum detachable ladder step having a foot rest surface measuring 5 by 12 ins.

Catalogs, Bulletins and Engineering Data

(63) ALUMINUM CONDUIT, couplings and 90-degree elbows. New booklet discusses advantages, economy and applications along with standard installation procedures. Kaiser Aluminum & Chemical Sales, Inc.

(64) SAFETY SWITCH for hoists which automatically cuts the power supply when a hoist or crane approaches the overload stage is described in new bulletin. W. C. Dillon & Co., Inc.

(65) SILICONE COMPOUND for reducing arcs, shorts and the formation of leakage paths on insulators exposed to contaminated atmospheres is described in illustrated brochure 4-215. Dow Corning Corp.

(66) REELITES for lifting or supporting extra-flexible rubber jacketed cords for an uninterrupted power supply. New 4-page Bulletin RL 258. Appleton Electric Co.

(67) CENTRIFUGAL FANS of corrosion-proof rigid plastic, in sizes from 10½ to 48 in. Two new bulletins, 9-20 and 9-21. Atlas Mineral Products Co.

(68) SILICON RECTIFIERS for replacing existing selenium rectifiers in alternator systems. 4-page folder. Leece-Neville Co.

(69) BATTERIES for industrial trucks are described in new technical bulletin 6230. Exide Industrial Div., Electric Storage Battery Co.

(70) ISOLATED PHASE BUS. Bulletin GEA-6874, 12 pages, gives detailed information on new unit-supported bus for reducing fault current stress on conductors and insulators. General Electric Co.

(71) TIME SWITCHES—how to select them. Complete section of Catalog 159 is devoted to an explanation of switching and timing, followed by listing of available light and power time switches. Tork Time Controls, Inc.

(72) EMERGENCY LIGHTING. Bulletin 243B, 20 pages, describes complete systems including batteries, control panels, contactors and lighting fixtures. Standard Electric Time Co.

(73) HOISTS AND CRANES. 8-page folder DH-28 contains data on construction details, dimensions and specifications. Wright Hoist Div., American Chain and Cable Co., Inc.

(74) LIGHT CONTROLS featuring non-interlocking Varistat and Radiastat dimmers for continuously adjustable control of lighting intensity. 4-page Circular 76N. Ward Leonard Electric Co.

(75) PRIMARY BATTERY combining recyclability of secondary battery, fast activation of the primary, and high output of the silver-zinc system is completely described in new technical bulletin. Yardney Electric Corp.

(76) PLATING RECTIFIER silicon conversion kits. Complete catalog gives prices and ordering information. Dresser Electric Co.

(77) NURSE CALL SYSTEMS. 8-page Bulletin 221 covers automatic indicator, master telephone set, control system, bedside stations, and miscellaneous accessories. Standard Electric Time Co.

(78) TUBING AND SLEEVING selector card to aid in the selection of electrical insulation for particular applications. Samples are incorporated into chart. Suflex Corp.

(79) DISTRIBUTION REGULATOR Type SFR, available in several ratings at 8660 and 13,200 volts, 3 phase, is described and illustrated in new Bulletin 21B9026. Allis-Chalmers.

(80) TRANSFORMER COOLING by vapor method is discussed in 8-page booklet B-7602, covering principles and practice. Westinghouse Electric Corp.

(81) POWER PROTECTOR. Bulletin GEA-6527, 8 pages, provides detailed information on Type LB-1 low-voltage power protector for heavy duty commercial building applications. General Electric Co.

(82) VOLTAGE REGULATOR. 30-finger REGOHM, designed to handle heavy currents encountered in battery-charger applications and generator control, is described in 2-page bulletin. Electric Regulator Corp.

(83) MASONRY ANCHORS. Slugin anchors, used for heavy-duty fastenings to masonry and concrete construction with standard machine bolts, are detailed with full specifications in new 6-page catalog. Star Expansion Industries Corp.

(84) MAGNET WIRE, lead wire, cables, tubing and Teflon tape. Latest engineering information and prices are given in new 64-page catalog. American Super-Temperature Wires, Inc.

(85) SOLDERING IRON TIPS. 81 new shapes and sizes plus 43 old sizes of plug and screw tips. Catalog 601. Hexacon Electric Co.

(86) HIGH-VOLTAGE CONTROL for squirrel-cage, synchronous and wound rotor motors covered in 16-page booklet. Cutler-Hammer Inc.

(87) SWITCHES, momentary contact, 30 amps. New series is described in new bulletin giving operating characteristics and applications. McGill Mfg. Co., Inc.

(88) PHOTOELECTRIC CONTROLS for street lighting. Bulletin GEC-1524, 4 pages, describes control elements and relays. General Electric Co.

(89) FLUORESCENT LIGHTING systems. Small-sized catalog provides condensed data on commercial and industrial units, recessed troffers and ceiling systems. Smithcraft Lighting.

(90) CIRCUIT BREAKERS and enclosures, panelboards, fusible service equipment, safety switches, industrial motor control, and lighting and power panelboards are included in new 32-page pocket-sized catalog. Federal Pacific Electric Co.

(91) CONNECTORS for terminal blocks which make positive connections with only ¼ turn of screwdriver without solder, lugs or crimping are described in new technical bulletin. Camblock Corp.

(92) TRANSFORMERS, dry type and liquid-filled, single and three-phase, 1 to 1500 kva, are detailed in new 40-page catalog, with price list. Marcus Transformer Co., Inc.

(93) INSULATING PRODUCTS for splicing and terminating wires and cables. 24-page catalog includes electrical tapes, connectors, kits and high-voltage splicing materials. Minnesota Mining and Mfg. Co.

(94) RESIDENTIAL LIGHTING. 1959 catalog covers reel-type pulldowns, dimmer, colonial hanging fixtures, chandeliers, accent lights, ceiling fixtures, wall brackets, outdoor fixtures, and others. Moe Light Div., Thomas Industries Inc.

(95) CLOCK SYSTEMS. 20-page bulletin 245 describes line of clock and program system components. Standard Electric Time Co.

(96) EXPANSION FITTINGS for conduit runs. Bulletin 12 includes line of weathertight fittings to relieve expansion strains in long runs of conduit and EMT. Spring City Electrical Mfg. Co.

(97) TRANSFORMERS for substation use, single and three phase, up to and including 10,000 kva, through 69 kv. Illustrated 8-page booklet CS-701. Kuhlman Electric Co.

(98) METAL-ENCLOSED BUS for utility and industrial use. 20-page bulletin gives ratings and construction details of complete line of isolated phase and nonsegregated phase bus, large-size conductor for high-voltage high-current electrical loads, and auxiliary equipment. I-T-E Circuit Breaker Co.

(99) SELENIUM RECTIFIERS. 10-page catalog gives descriptions and specifications for cell sizes in range from 1-in. square to 12 by 16 in. for stacks of practically any size in dc ratings from 26 to 52 volts. Syntron Co.

(100) MOTOR CONTROLS. Quick selector chart with handy index tabs includes information on ratings, sizes, features, and catalog information. Arrow-Hart & Hegeman Electric Co.

(101) SYNCHRONOUS GENERATORS. High-speed packaged units 187 kva and larger, single or 3-phase, are covered by bulletin 2100-PRD-254. Electric Machinery Mfg. Co.

(102) CENTRIFUGAL SWITCHES with adjustable speed range 70 to 5000 rpm, are described in new product bulletin giving application data, cutaway views and construction. Euclid Electric & Mfg. Co.

(103) TEMPERATURE CONTROLLER for electric heat-treating furnaces. Bulletin GE-60001 describes electronic controller which is actuated by signals from thermocouples. Hagan Chemicals & Controls, Inc.

(104) OIL CIRCUIT RECLOSER for use on circuits 2.4 to 23 kv, phase-to-phase, and having available fault currents up to 2500 amperes; load ratings range from 5 to 100 amps. Bulletin CRIB. Line Material Industries, McGraw-Edison Co.

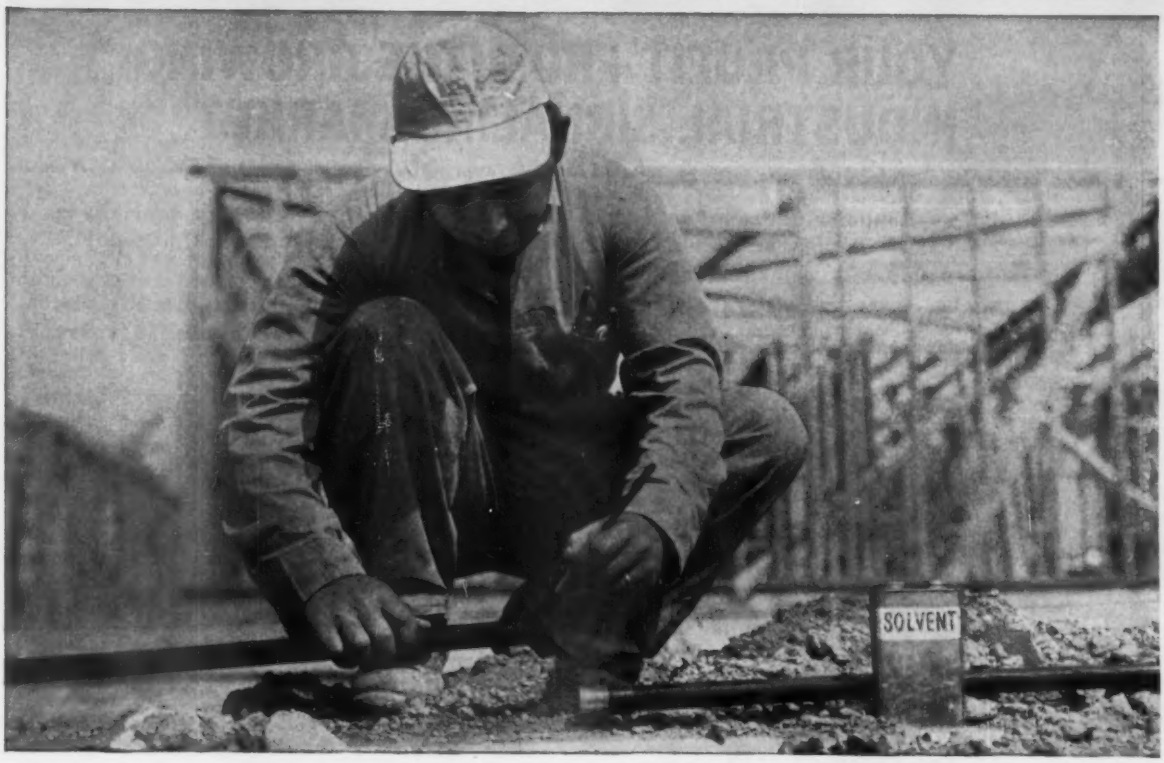
(105) LIMIT SWITCHES. 4-page bulletin describes and illustrates line of industrial duty precision limit switches for applications requiring millions of operations. Cutler-Hammer, Inc.

PLYMOUTH RUBBER COMPANY, INC.

QUALITY SINCE 1896 CANTON, MASSACHUSETTS

Naugatuck KRALASTIC

RUSTPROOF, CORROSIONPROOF, LIGHTWEIGHT, TOUGH, SNAKEABLE PLASTIC PIPE



and it joins with a brush!

No need for expensive threading operations and wrench work—no time wasted—Kralastic pipe can be joined in *seconds* by *anyone!*

Just paint mating surfaces of Kralastic pipe and fitting with a special solvent or cement—slip them together and allow them time to set, and you have made a connection as durable as the pipe itself!

And Kralastic *is* durable!

It can't rust or rot, is permanently free of electrolytic corrosion. It's unharmed by soil acids, natural gas, most chemicals. And because it's one of the toughest of all plastic materials, it resists damage from tools, rocks, and rough handling.

What's more, Kralastic pipe is flexible enough to follow uneven ground contours without costly, job-prolonging fittings. And it's easily cut with an ordinary hacksaw.

This tough rubber-resin material—one of the first to produce successful plastic pipe—has proved itself not only in natural gas lines, oil field pipe, and electrical conduit for home and industry, but in hundreds of other *tough* applications including water transmission lines.

Better investigate Kralastic® pipe and learn more of its *many* advantages. Write today to the address below.

US RUBBER

United States Rubber

Naugatuck Chemical Division 334K Elm Street Naugatuck, Connecticut

Rubber Chemicals • Synthetic Rubber • Plastics • Agricultural Chemicals • Reclaimed Rubber • Latices

DIST. OFFICES: Akron • Boston • Gastonia • Chicago • Los Angeles • Memphis • New York • Phila. • CANADA: Naugatuck Chemicals, Elmira, Ont. • CABLE: Rubexport, N.Y.

MEMO TO: Mr. Electrical Contractor
FROM: Edwards Company, Inc.

Subject: **YOUR PROFIT FROM THE GROWING INDUSTRIAL SIGNALING MARKET**

1. New opportunities for industrial signaling installations await you. Plant expansion and modernization programs demand the most modern equipment manufactured.

2. To take advantage of this growing market, you should point out what control, communication and protection products are available to your industrial customer.

3. These signaling products will benefit your customers in two fields:
   - Greater safety to life and property
   - Increased efficiency and productivity

4. **Emphasize these points to your customers:** There is great new potential open to them for vastly improved safety and efficiency. Relatively inexpensive signaling systems and components pay for themselves many times over in streamlined administration and communication. They make a better, safer, more productive establishment wherever they're installed.

5. Edwards is the only manufacturer providing a complete line of signaling equipment of every type required to bring industrial/institutional/commercial facilities up to date.

   and remember this...

   Edwards technical specialists and your Edwards distributor provide complete technical assistance during planning, installation and follow-up. Edwards recommends the recognized electrical contractor as the installer of its equipment -- this safeguards profitable business for you and assures the customer of a dependable installation.

6. For detailed technical literature covering all types of industrial/institutional/commercial signaling equipment, see your electrical distributor, the Edwards specialist in your area, or write us direct.

Here briefly are some of the systems we're talking about:

EDWARDS FIRE ALARM AND PROTECTION SYSTEMS—Ultra-modern automatic detection and alarm equipment protects life and property.

EDWARDS CLOCK AND PROGRAM SYSTEMS—Most efficient method of scheduling production operations, lunch or closing hours, with constantly accurate time throughout an installation.

EDWARDS PAGING SYSTEMS—Time-saving, efficient paging of key personnel is assured with Edwards audible and visual coded paging systems.

EDWARDS ANNUNCIATORS—For all types of trouble indications for production processes, plant operations control, or general office signaling.

EDWARDS

Specialists in signaling since 1872
CONTROL • COMMUNICATION • PROTECTION
Edwards Company, Inc., Norwalk, Connecticut
(In Canada: Edwards of Canada, Ltd., Owen Sound, Ontario)

Reader's Quiz

QUESTIONS from readers on problems of industrial equipment, installations, maintenance and repairs. Answered by electrical maintenance engineers and industrial electrical contractors out of their experience. For every question and every answer published we pay $5.00

Corrosion

QUESTION J35—Some engineers advocate installing a heavy bare copper grounding network in the earth around the substation and building structure to ground both structure and equipment. In addition, it is suggested that this underground network be connected to the underground water pipe at convenient locations. Does this not form a perfect battery system with the copper as one electrode and the iron pipe as the other, and is it not true that corrosive action would begin immediately and continue until the electrodes deteriorate?—R.G.O.

ANSWER TO J35—R.G.O. is quite correct in stating that a copper grounding system connected to the underground iron water piping forms a perfect battery system. This can also be true on lead covered cables. Corrosion engineers term this a galvanic couple, where the iron or lead is the anode or corroding metal, and the copper forms the cathode or non-corroding metal. The rate of corrosion will be greater than would normally be expected of iron underground and will depend on the electrical resistance of the earth and the ratio of bare areas. Since the bare area of copper is usually so great with relation to the iron or lead areas in these instances, very severe corrosion will be caused to the iron or lead. This situation can be corrected by (1) isolating the dissimilar metals, (2) using steel in place of copper and cathodically protecting the steel, or (3) using zinc anodes in place of copper for the grounding network metal. Since a variety of perimeters surround the corrective action, it is best handled by experienced corrosion engineers.

Should additional information be desired by R.G.O., we would be pleased to send him copies of articles written on this subject by members of our consulting corrosion engineers staff.—J.P.R.

ANSWER TO J35—The type of installation R.G.O. describes was used years ago but is not generally considered good practice today. As R.G.O. suggests, a galvanic cell would be set up in most environments, in which the copper would be practically everlasting and the iron and steel would be destroyed.

A more modern installation would consist of a stainless steel grounding network bonded to other underground structures and to water mains by means of lead covered copper conductors.—E.R.H.

ANSWER TO J35—We have similar installations of copper grounding network. We also tie in the lightning arrester grounds to this network, then it is run to water lines and also to the steel frame work of the plant. No corrosive action has taken place on this installation in the seven years of its life.—E.S.H.

Aluminum Conductors

QUESTION K35—At the plant where I am employed there is an old 1250 mcm, 3-phase, 440-volt installation. We soon will have our load increased to 2000 amps on this main entrance to the switchboard. I would like to run a 1750 mcm aluminum conductor in parallel with this old copper line. Is this a good method or would the aluminum line due to its larger outside diameter have a lower impedance to the 60-cycle current and tend to hog the load? Would it be best to install another copper cable, size 1250 mcm, with old line? When operating at 60 cycles, 440 volts, does the outside diameter of the cable greatly affect its impedance? When running two large cables of identical length in free air is it necessary to de-rate the cable because of the difficulty in exact division of the load?—M.D.

ANSWER TO K35—To parallel a 1750 mcm aluminum conductor with a 1250 mcm copper conductor would be in violation of section 3105 of the National Electrical Code, which states, "Conductors in sizes 1/0 and larger may be run in multiple provided they are of the same length and have the same circular-mil area and type of insulation. Where conductors are run in multiple, they shall be arranged and terminated at both ends in such a manner as to insure equal division of the total current between all conductors that are involved."

It is not necessary to de-rate conductors in multiple when run in free air or when each separate set is run in a separate conduit.

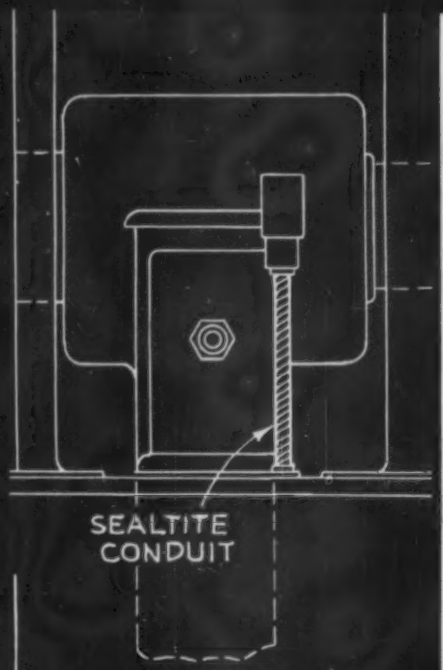
It *is* necessary to de-rate them when more than 3 conductors are run in a single conduit. Note 4 following tables 1 and 2 of the code permit 80% of the rated current-carrying capacity when 4 to 6 wires are run in a conduit, and 70% when 7 to 9 wires are run in a single conduit.

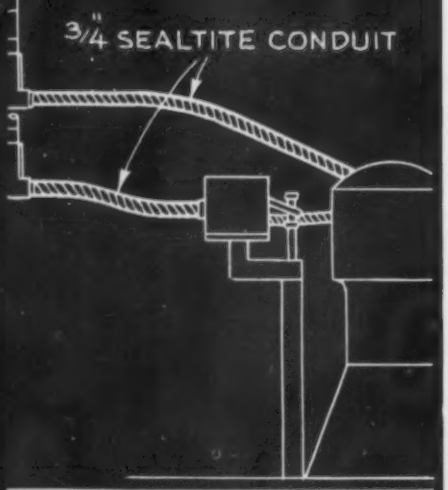
Table 18-a of the code gives the multiplying factors for converting the dc resistance to ac resistance on 60-cycle systems for all standard size conductors. This table shows such factors for both aluminum and copper conductors, and for open-air runs as well as for runs in metal raceways.—W.R.S.

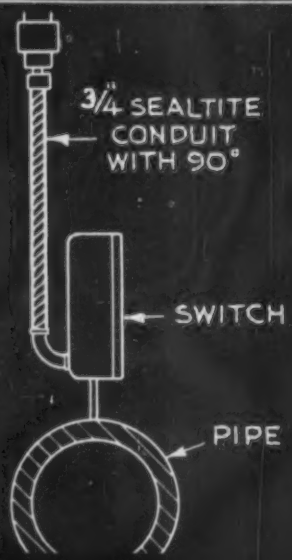
ANSWER TO K35—M.D. doubtless has type RH or type V insulation on his 1250 mcm copper cable which is installed as open wiring on insulators and contemplates using the same on the proposed 1750 mcm aluminum to carry 1000 amps per run at 440 volts.

By dividing by 84% the NEC allowable amperes for 1250 mcm copper, M.D. correctly gets 1750 mcm as the proper size for equivalent aluminum cable. In the Standard Handbook for Electrical Engineers are formulas and tables for calculating the inductance of open single wires and their reactances in either equilateral triangle or flat plane arrangements. By these equations we find that the 1750 mcm cable has about 85% as much reactance as the 1250 mcm, for either aluminum or copper, due to the larger diameter. Aluminum's higher resistivity requires the 1750 mcm size to equal the resistive drop of the 1250 mcm copper but this same higher resistivity keeps more of the current inside the core of the wires so the skin effect correction for aluminum may be a little less at 60 cycles.

Thus the 1750 mcm aluminum with resistance equal to 1250 mcm copper and 85% as much reactance







To carry good engineering over

SEALTITE COMES IN THREE TYPES:

TYPE U.A.— TYPE C.S.A. Specifications for Type U. A. (Underwriters' Laboratories Approved) and Type C. S. A. (Canadian Standards Association Approved). Construction: flexible galvanized steel core, positive ground and tough extruded outer cover.

TRADE SIZE	INSIDE DIAMETER		OUTSIDE DIAMETER		APPR. INSIDE BEND	EST. WGT. (Lbs. Per
(Ins.)	Min.	Max.	Min.	Max.	DIAM.	100 Feet)
⅜	.484	.504	.690	.710	6	30.0
½	.622	.642	.820	.840	7	36.6
¾	.820	.840	1.030	1.050	10	48.2
1	1.041	1.066	1.290	1.315	12	87.7
1 ¼	1.380	1.410	1.630	1.660	15	116.5

TYPE E. F.* is extra flexible—for machine tools and industrial equipment. It meets J.I.C. requirements.

TRADE SIZE	INSIDE DIAMETER		OUTSIDE DIAMETER		APPR. INSIDE BEND	EST. WGT. (Lbs. Per
(Ins.)	Min.	Max.	Min.	Max.	DIAM.	100 Feet)
⅜	.485	.500	.695	.710	5	24
½	.620	.635	.825	.840	5	29
¾	.815	.830	1.035	1.050	6	39
1	1.030	1.050	1.295	1.315	8	67
1 ¼	1.370	1.390	1.635	1.660	10	87
1 ½	1.575	1.595	1.875	1.900	12	105
2	2.020	2.040	2.350	2.375	15	135
2 ½	2.480	2.505	2.850	2.875	20	198
3	3.070	3.100	3.470	3.500	26	282
4	4.000	4.040	4.460	4.500	34	414

Commercial tolerances apply on above figures.

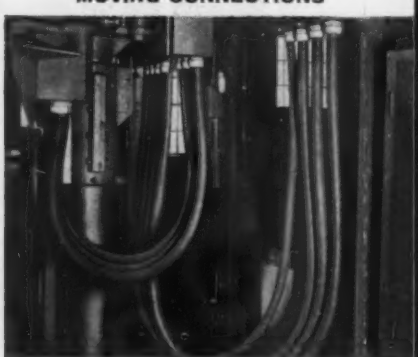
WHERE TO GET SEALTITE — Electrical Wholesalers stock Sealtite with gray or black cover in easy-to-handle cartons or on reels. Be certain you ask for and get the quality conduit marked "Sealtite" on the cover. Buy it in long lengths and cut it on the job without waste. Your wholesaler also stocks liquid-tight connectors.

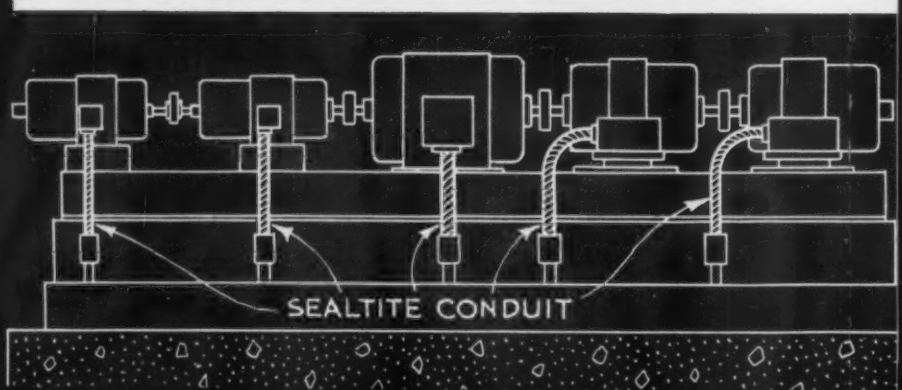
Free Booklet S-539 gives you full information on Sealtite. For your copy, write: The American Brass Company, American Metal Hose Division, Waterbury 20, Conn. In Canada, Sealtite is approved by Canadian Standards Association, and sold by Anaconda American Brass Ltd., New Toronto, Ont.

*Pat. Applied For 58154

FOR WET SPOTS

MOVING CONNECTIONS





from plans to performance insist on SEALTITE

the original flexible, liquid-tight electrical conduit that protects wiring against oil, grease, water, dirt, chemicals, corrosive fumes, salt spray, weather.

SEALTITE is a flexible *and* liquid-tight electrical conduit. It gives maximum protection to your wiring when it must connect moving parts, absorb vibration, follow machine contours, flex into U-bends, be easily maintained or be safeguarded between misaligned outlets.

It is being used successfully in wet locations, in tunnels, power plants, steel mills, canneries, chemical plants and in many outdoor applications.

CUTAWAY SECTION of Type U.A. Sealtite shows tough polyvinyl jacket over flexible galvanized steel core. Copper conductor wound spirally inside conduit gives positive ground.

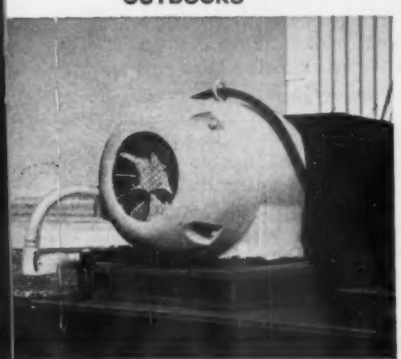
Insist on the conduit marked

SEALTITE®

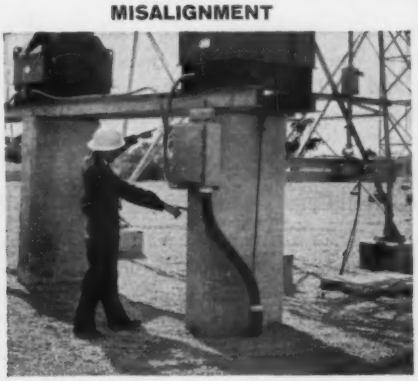
Flexible, Liquid-Tight Conduit

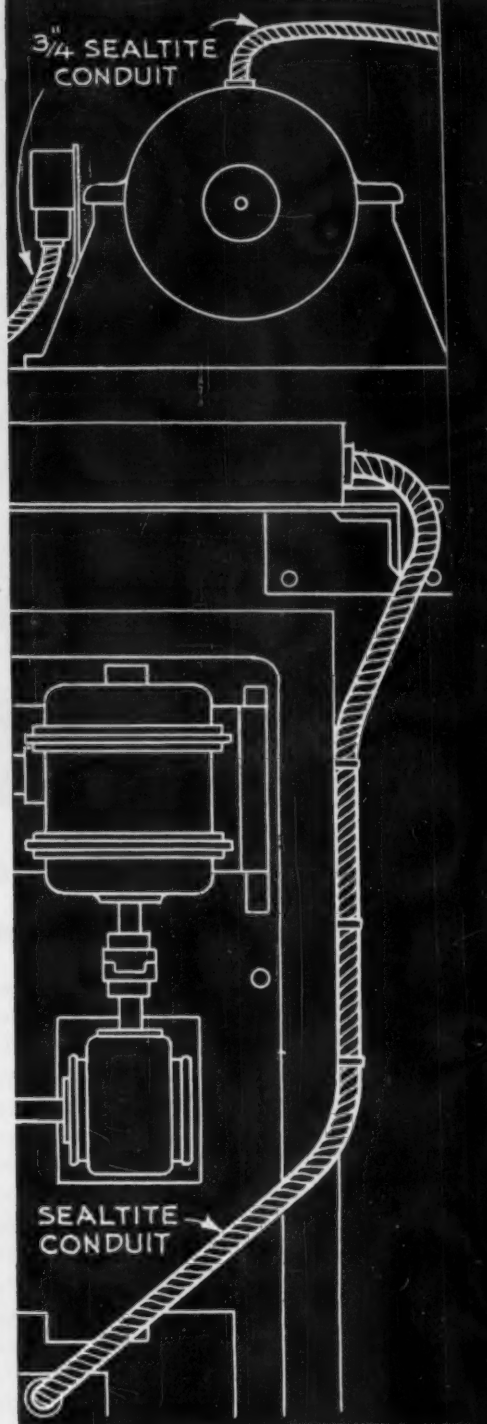
an* ANACONDA® *product

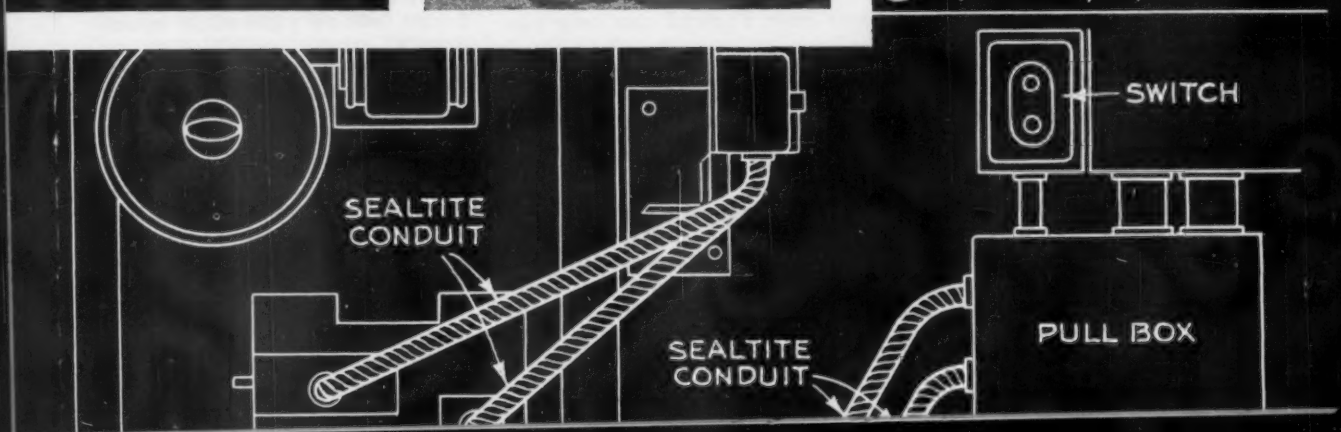
OUTDOORS



MISALIGNMENT







would have a slightly lower total impedance than the copper and would tend to act not as a hog but as a piglet in sharing the total current. The bad part is that there would be a phase angle difference between the voltage drops in the aluminum and the copper, due to differing R/X ratios, which would encourage circulating currents. For this reason and section 3105 of the NEC, M.D. would be wise to use either 2 copper cables or 2 aluminum cables of the sizes required for his total current. These identical cables do not have to be de-rated. —R.W.K.

Electric Heater

QUESTION L35—A customer has a 2000-watt, flush mounted heater installed in his bathroom wall adjacent (because of space limitations) to the flush toilet. Because of the hazard to the tots in the family, he has reduced the wattage to 314 by transposing the connections in the fuse panel to provide a mere 115 volts in place of 230 volts.

Wishing the maximum heat when the extremes of winter occur, he wishes a wire fished down to the crawl space and the installation of a 3-pole switch on the heater to use either 230 or 115 volts, the transposition in the fuse panel being reworked to restore the old order of connection.

In view of the fact that modern neutrals are unfused, is it "legal" to connect the heater neutral to any crawl space circuit (they are 12s)? Or must it be extended back to the neutral bus?—P.C.Z.

ANSWER TO L35—It is not "legal" to connect the heater circuit neutral to any other circuit neutral. Run it back to the bus. See B. A. McDonald's clear explanation on page 121 of the December issue of *Electrical Construction and Maintenance.—R.W.K.*

ANSWER TO L35—If heater is 2-wire, 2000-watt, 230-volt, it would draw 8.7 amps.

Same heater on 115 volts would draw 4.35 amps at 500 watts.

These heaters are usually 2-wire, but they should have a ground wire to ground, not to neutral. This ground should be connected to frame of heater, not to heating element for adequate safety.

The current is 8.7 amps on 230 volts and is 4.35 amps on 115 volts, so if the run is not over 50 ft, No. 14

SPANG Underfloor Duct provides for future wiring expansion at Moisant International Airport

"We installed over 6,500 ft. of SPANG Underfloor Duct on the second and third floors and West Pier at Moisant International Airport Terminal Building in New Orleans to handle power and telephone wiring," says Mr. Walter J. Barnes, proprietor of Walter J. Barnes Electric Company, New Orleans, Louisiana.

Offers many advantages

"SPANG Underfloor Duct offers ease of handling and installation plus clearly-marked junction boxes that practically eliminate installation mistakes. Power and phone lines are readily accessible at regular intervals. Future expansion and office changes in the terminal building will be easily handled, regardless of wiring requirements, without extensive or costly construction."

Helps you save money

Get all the facts about how SPANG Underfloor Duct . . . and SPANG Header-duct and newly-designed SPANG Fittings . . . can help you make fast, *top-quality* installations. Write for complete literature, or phone your nearest SPANG Representative.

Architect: Goldstein, Parham & Labouisse; Herbert A. Benson and George J. Riehl, New Orleans, La.

Electrical Engineer: Louis N. Goodman & Associates, New Orleans, La.

General Contractor: J. A. Jones Construction Company, Charlotte, N. C.

Electrical Contractors: Walter J. Barnes Electrical Company, and Gibson & Odom, Electric Contractors, New Orleans, La.

"We've used SPANG Underfloor Duct before," says Mr. Walter J. Barnes. "Its adaptability to future expansion was an important factor in its selection for the Moisant job." Airport serves 14 airlines.

SPANG Underfloor Duct is quickly installed. Light-weight aluminum junction boxes contribute to easy handling; box design helps prevent costly installation errors. Laid over a steel sub-floor, duct was covered with concrete after it was positioned and fastened down.

SPANG UNDERFLOOR DUCT

THE NATIONAL SUPPLY COMPANY

Subsidiary of Armco Steel Corporation

TWO GATEWAY CENTER, PITTSBURGH, PA.

wire is adequate. I do not see how P.C.Z. gets the wattage of 314 watts.

Running the ground wire to any available circuit is strictly haywire; in case of trouble in the heater other circuits could be upset and equipment damaged.

If it is desired to operate part time on 230 volts and part time on 115 volts then 3 wires are required to the fuse box and a fourth wire for grounding of the heater frame to cold water pipe or ground rod for safety. When running these 4 wires, if armored cable (BX) is used, be sure to keep your two hot wires and neutral in the same BX (3-wire) so no trouble from induction results. The fourth wire for equipment ground can be run separate. If non-metallic Romex is used, two 2-wire cables could be used provided they are taped together or stapled as a four wire cable.—E.E.M.

ANSWER TO L35—Aside from the fact that I do not agree with the figures of P.C.Z., I would like to say from a point of operation, that I would hesitate to tie in a heater circuit with some other circuit. I feel that such circuits should be independent, as the failure of one circuit could affect the operation of the other one. Also there would be the matter of the carrying capacity of the neutral. There would also be the possibility of a fault on one circuit affecting the operation of the protective device in the other circuit.

Codewise, it appears that during the time when equipment was operating on 115 volts, there would be a disconnect in the neutral conductor. This, of course, is not in line with code requirements. It is also my understanding that any field changes or alterations would void any Underwriters approval on equipment. From personal observation, some of the field alterations leave much to be desired.

As watts is the product of voltage times amperes times power factor, and as heat is represented by Btu's and as 1 watt equals 3.4 Btu's, it stands to reason that with a smaller output in watts it will require a longer time to produce a given number of Btu's; inversely, a shorter time with a larger wattage output. Therefore there does not appear to be economical reason for the lower wattage output, and as 115 volts will hurt as much, or kill just as dead as 230 volts, it just does not appear to be good reasoning to divert from the already approved method of the manufacturer.

It would appear that the most practical method would be to either install two smaller units or to install a unit that was designed and approved to give various outputs such as the elements of a range.—C.L.

Can You Answer These QUESTIONS

QUESTION X35 — At the plant where I am employed, we are to light a building, size 120 by 200 ft. We would like to use fluorescent lighting; approximately 50 foot-candles are required. Should the standard type 8-ft fluorescent lights be used, or would it be best to use special type 600-volt 840-cycle fluorescent lights? What is the cost comparison, efficiency, maintenance and life of each type? Are high-cycle lighting systems commonly used today?—M.D.

QUESTION Y35—We have just completed an installation of 3-phase 4-wire full neutral copper bus duct. The duct runs from basement to the 11th floor of an office building.

We have discovered that you can obtain an ampere reading from the neutral bus to ground. The reading diminishes as you go down until the second floor, at which point ampere reading is approximately one-half of reading at 11th floor. We get no reading below second floor.

1. What is the cause of this condition?
2. Should it be corrected, and if so, by what method?—W.E.S.

QUESTION Z35—Is it possible to rewind a 3-phase motor for single-phase? What condition must be met for proper operation and what will be the new horsepower as a percentage of the old rating?—J.A.M.

QUESTION A36— What determines the voltage rating of choke coils on lightning arresters? — G.J.P.

QUESTION B36—Which type of capacitor connection at the load, series or parallel, is better for power factor correction of ac induction motors and why?—W.E.G.

PLEASE SEND IN YOUR ANSWERS BY APRIL 15

These success stories prove that OKOCORD portable cables withstand the roughest abuse

On big jobs like the tough ones shown on this page, you'll find Okocords chalking up excellent service records on assignments that might well knock out ordinary portable cables. One reason is Okonite's ability to come up with unusual designs, special service characteristics or engineered accessories to meet unusually punishing environments or mechanical action. And their mold-cured toughness, their "Quality-Controlled" manufacture of standard as well as special designs help explain why . . .

For normal, rugged usage, such as portable tools in construction projects, shop work or other industrial operations, Okocord outperforms any other cable. This extra value built into every Okocord means dollars in your pocket in terms of longer life, lower maintenance and utmost dependability.

For complete specifications on the many Okocord constructions, including splicing and terminating instructions and other engineering information, write on company letterhead for 64-page Bulletin EC-1108, The Okonite Company, Passaic, N. J.

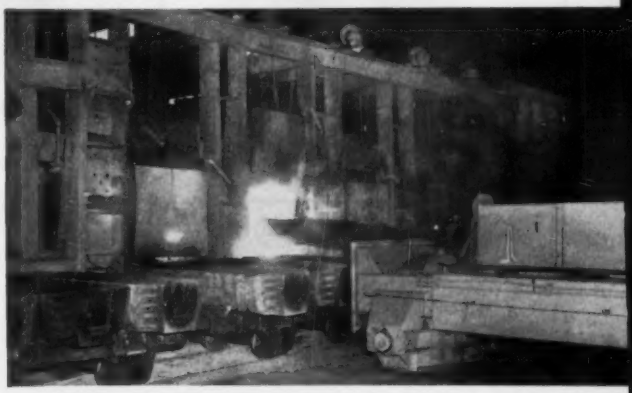
where there's electrical power . . . there's

OKONITE CABLE

Absorbs abuse. Twisting and scraping over dirt and crushed rock, buried for days on end in water and muck, an Okocord trailing cable keeps the huge River Queen in constant operation.

Display strength and flexibility. Okocord power and control cables wind and unwind continually to move up and down with this bridge's 1000 ton lift span . . . withstand sunlight, high humidity and corrosive salt spray.

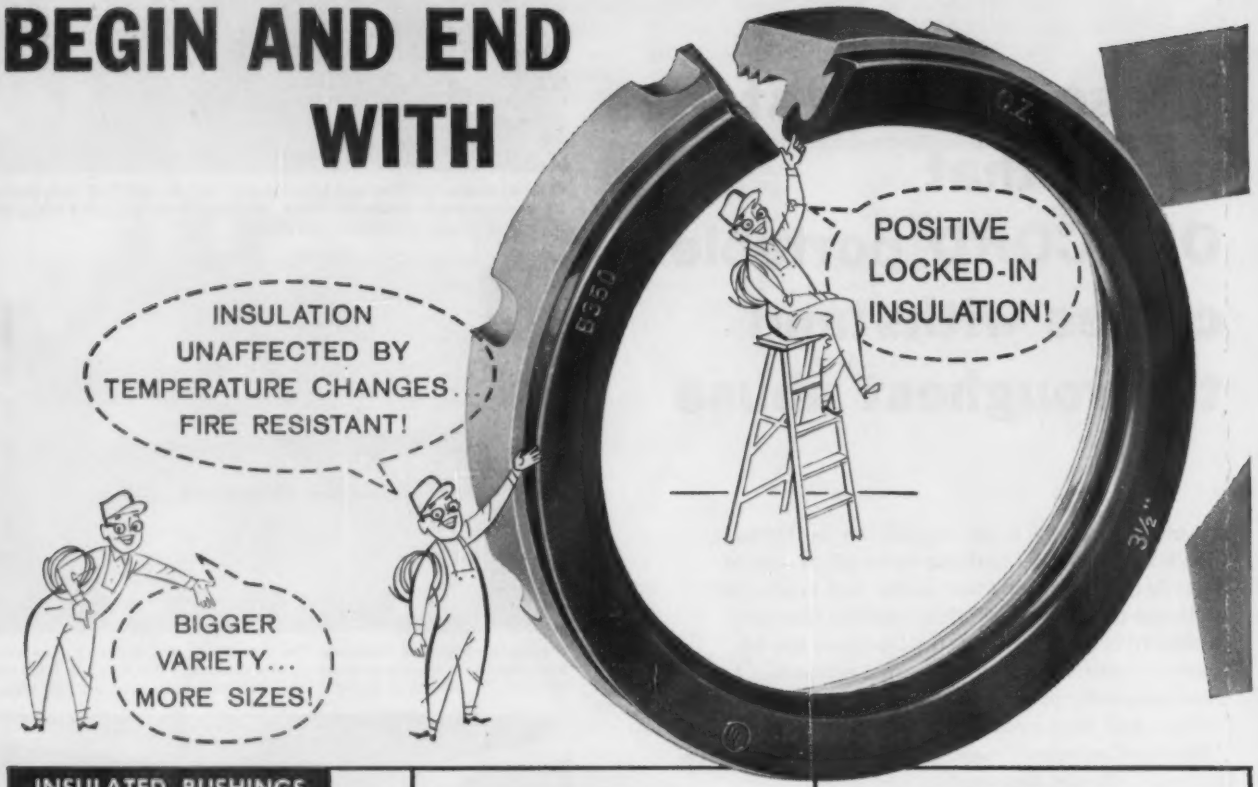
Outlast others 2 to 1. Okocord mine shuttle car cables show unequalled staying power even though faced with constant reeling under tension, run-overs and abrasion from falling coal.



Withstand intense heat. This open hearth charging buggy is controlled by Okocord flexible cables that must wind and unwind every time the arm enters the furnace—hundreds of times daily.

6413

THE FINEST CONDUIT RUNS BEGIN AND END WITH



INSULATED BUSHINGS

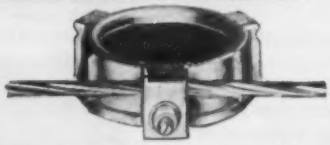
1 Type "B" — Designed for prevention of grounds. Made of highest grade malleable iron or steel, insulated with Bakelite molded and locked into bushing. Sizes: ½" to 6".

2 Type "AB" — New addition to the O.Z. line . . . made of high-strength aluminum alloy with interlocked Bakelite insulation. Sizes ½" to 6".

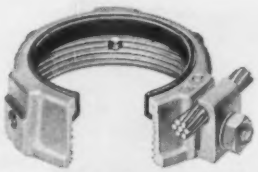
3 Type "BL" — Combines protection of insulated bushing and means for making quick, positive ground connections. Consists of Type "B" equipped with combination lug. Sizes: ½" to 6".

7 Type "E" — For spacing and individually insulating wires as they emerge from conduit. Molded canvas Bakelite covers have high dielectric and mechanical strength. Sizes: ½" to 6".

GROUNDING BUSHINGS



8 Type "GB" — Corrosion-resistant bronze. Ideal for grounding banks of conduit where metallic-protected cable is used. Sizes: ½" to 6".



9 Type "IGB" — Similar to "GB" except insulated with Bakelite collar locked into bushing. Sizes: ½" to 6".

Z bushings

O.Z. holds the line on quality — with the line that gives you greatest selection!

Whatever your bushing requirements, O.Z. has the type and size you need! As with all O.Z. products, *completeness* is the keynote! And, as always, this completeness is backed by another O.Z. constant: *quality!* O.Z. bushings utilize only the traditionally-superior materials: Cadmium-plated or hot-dip galvanized iron and steel, bronze, and molded canvas Bakelite . . . all at prices competitive with substitute materials . . . all time-proven in finer conduit runs everywhere. For more information on O.Z. bushings, call your local O.Z. distributor or write direct to the company.

4 Type "SB" — For use on conduit having no threads. Case-hardened cup-point set screws for fastening. Sizes: ½" to 6".

5 Type "SBT"—A cadmium-plated bushing for thin-wall conduit application. Fastens with case-hardened, cup-point set screws. Sizes: ½" to 2".

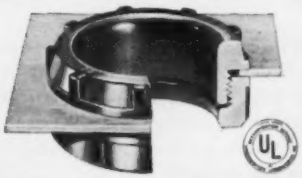
END BUSHINGS

6 Type "EL" — Provides the protection of end fittings and permits quick, positive ground connection by means of combination lug. Sizes: ½" to 6".

INSULATING BUSHINGS

10 Type "A" — Made of molded canvas Bakelite having high dielectric and mechanical strength. Sizes: ½" to 6".

11 Type "BB" — Molded Bakelite. Male thread. Installed with locknut. Insulates cables passing through metal boxes or troughs. Sizes ½" to 6".



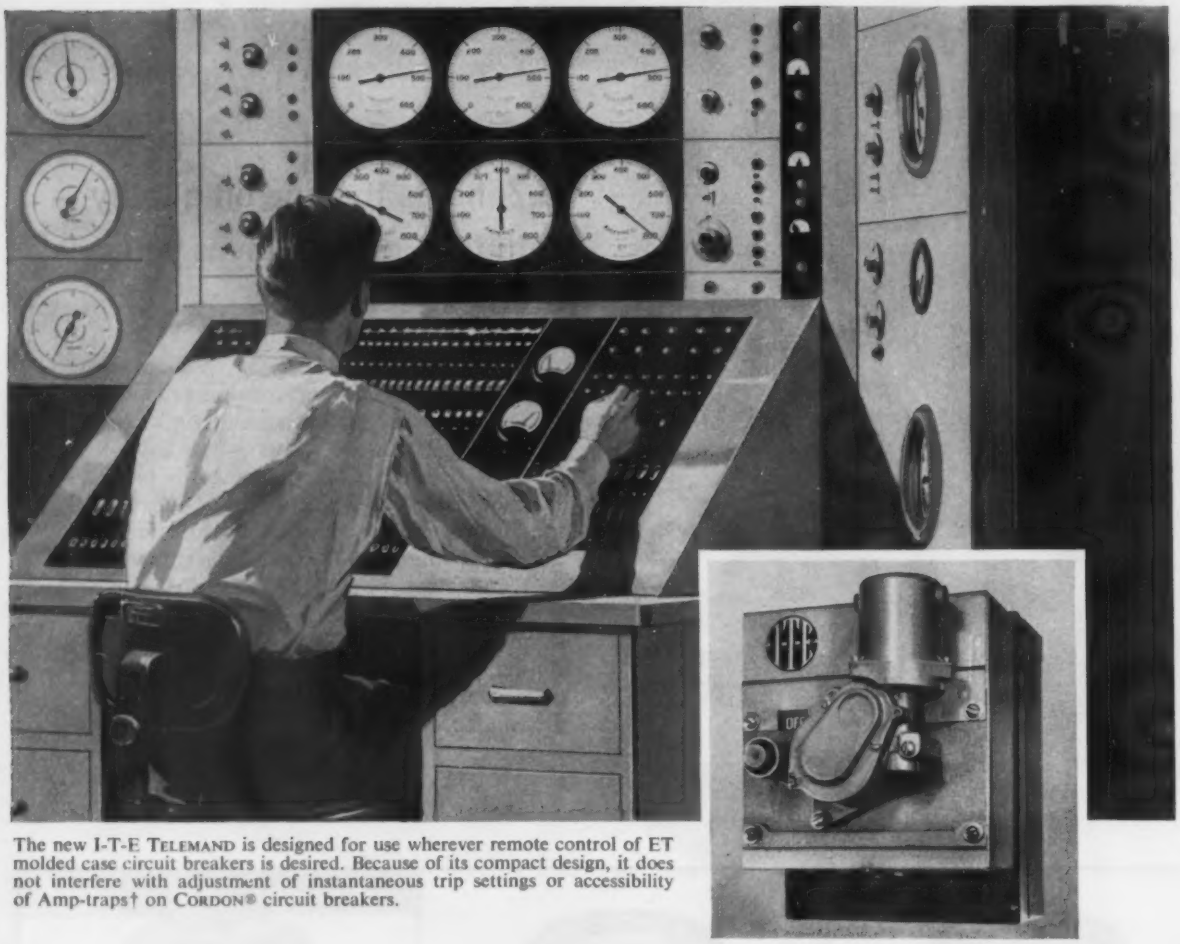
12 Type "ABB" — Combination of Type "A" and "BB" bushings to insulate cables passing through metal boxes or troughs. Sizes: ½" to 6".

O.Z. ELECTRICAL MANUFACTURING CO., INC.

262 BOND STREET • BROOKLYN 17, N. Y.

Sales Office and Warehouse: 406 So. Cicero Avenue, Chicago 44, Ill. • ESterbrook 9-0326
Office and Factory: 749 Bryant Street, San Francisco 7, Calif. • GArfield 1-7845

- CAST IRON BOXES
- CABLE TERMINATORS
- POWER CONNECTORS
- SOLDERLESS CONNECTORS
- GROUNDING DEVICES
- CONDUIT FITTINGS
- INTERLOCKED ARMOR CABLE FITTINGS



The new I-T-E TELEMAND is designed for use wherever remote control of ET molded case circuit breakers is desired. Because of its compact design, it does not interfere with adjustment of instantaneous trip settings or accessibility of Amp-traps† on CORDON® circuit breakers.

NEW EXCLUSIVE DESIGN

I-T-E TELEMAND*

Remote Control of Molded Case Circuit Breakers

I-T-E Circuit Breaker Company now offers the electrical industry another exclusive—the new TELEMAND. This I-T-E designed device is the sturdiest, most foolproof, compact and economical unit ever built for electrically opening, closing or resetting molded case circuit breakers by remote control.

Designed to fit any I-T-E molded case breaker in ratings from 70 to 800 amperes, including the CORDON® line, this unit can be installed in a matter of minutes.

I-T-E's TELEMAND is industry's first really satisfactory answer to remote control of molded case circuit breakers. In remote control applications, the I-T-E TELEMAND ET Breaker combination may be used where bulkier, more expensive equipment would be required.

It is particularly appropriate for use in automatic transfer schemes and is ideal for use as a combination switch and protective device. Write today for full details. I-T-E Circuit Breaker Co., 1900 Hamilton St., Phila. 30, Pa.

*Trademark, I-T-E Circuit Breaker Co.

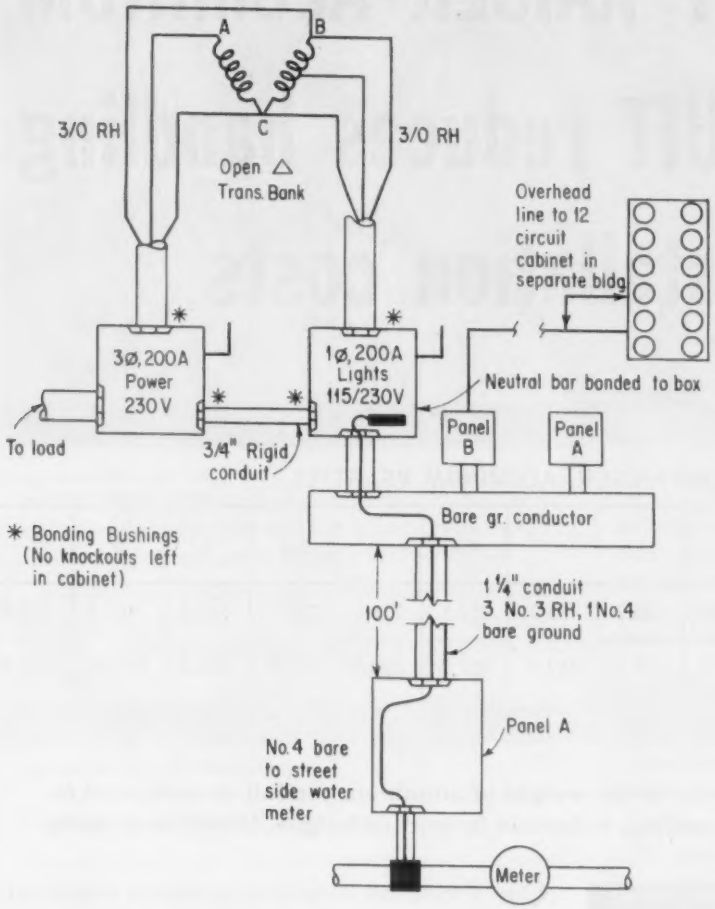
†Amp-trap is a registered trademark of the Chase-Shawmut Company

I-T-E CIRCUIT BREAKER COMPANY

Questions on the Code

Answered by:

B. A. McDONALD, *New York Board of Fire Underwriters, Rochester, N. Y.*
B. Z. SEGALL, *Consulting Electrical Engineer, New Orleans, La.*



Grounding and Bonding of Services

Q. *Would you please comment on the diagram above insofar as code requirements on bonding and grounding of the service entrance equipment is concerned? Is the No. 4 bare copper conductor of proper size to ground this service? Is the power panel grounded properly?—R.C.M.*

A. According to your illustration, you actually have two services, connected to the same transformer, entering the building. One serves a 3-phase, 230-volt power load and the other a single phase 115/230-volt lighting load. Section 2514 requires the neutral conductor of single phase service to be grounded, and Sections 2532 and 2533 requires the service raceways and enclosures of both services to be grounded. In the case of the single phase service the neutral conductor is bonded to the service equipment enclosure, and both are grounded through a common grounding conductor as ermitted by section 2553. The size of a common grounding conductor for a 3/0 service is a No. 4 copper conductor as covered by Section 2594-a. The 3-phase power system may be grounded through a No. 4 copper conductor, or a ¾-in. conduit as covered by Section 2594-b.

Your wiring diagram shows the single phase service to be grounded by a No. 4 bare copper conductor run in a 1¼-in. conduit with other conductors o the grounding electrode. This procedure is recognized by Section 2598, and the conduit fill limitation is also satisfied. The 3-phase power service equipment is grounded through a ¾-in. conduit, provided with bonding bushings, to the common grounding conductor at the single phase service equipment. In other words, we are using the No. 4 common grounding conductor to serve the dual role of grounding both services. Since I am unable to find any specific rule of interpretation covering the situation, the following opinion is personal, and based on my concept of the factors involved.

The size of a grounding conductor, as covered by Sections 2594 and 2595, is primarily based on the size of the service conductor to which it is connected, or the size of the service conductors. The larger the service conductor, the larger the grounding conductor up to a maximum of No. 000. Unlike service conductors which are required to carry their full load current ratings continuously, the grounding conductor normally carries no current, and functions only when some particular types of faults occur. In many cases, such faults are cleared rapidly, and short circuit currents of high magnitude exist only for a short period of time. Many faults which occur on the load side of a service that has a common grounding conductor are cleared without resort to the use of the grounding conductor.

In the case presented by you the No. 4 grounding conductor, in my opinion, satisfies the code when a fault occurs on one of the services. If however a fault occurs simultaneously on both services, there could be a question with respect to the sufficiency of the No. 4 grounding conductor. I do not believe that such a dual fault is probable. It may be possible but I doubt if the code intends to safeguard such a possibility. In line with the foregoing logic, I am inclined to believe that the No. 4 grounding conductor may serve a dual role.

It is significant to note however that when the single phase grounding conductor is smaller than that which is required for the 3-phase service, the larger of the two must be used. I also note that you have eliminated the use of bonding bushings on the enclosures housing the grounding conductor as it travels to the grounding electrode. Such procedure satisfied the code as evidenced by Official Interpretation No. 350 issued March 6, 1950. The only other question with respect to

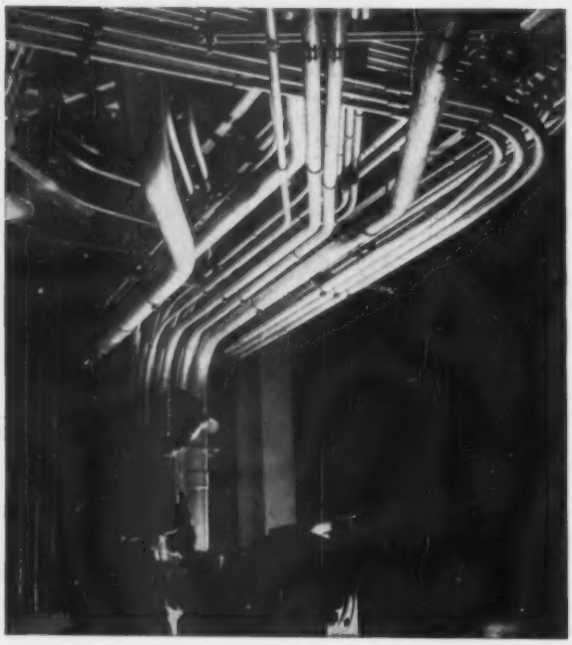
LIGHTWEIGHT KAISER ALUMINUM RIGID CONDUIT reduces handling and installation costs

WEIGHT COMPARISON, ALUMINUM VS. STEEL

U.L. required minimum weight per 100 ft. including couplings, lbs.

Trade Size, Inches	½	¾	1	1¼	1½	2	2½	3	3½	4	5	6
ALUMINUM	27.4	36.4	53.0	69.6	86.2	115.7	182.5	238.9	287.7	340.0	465.4	612.9
STEEL	79.0	105.0	153.0	201.0	249.0	334.0	527.0	690.0	831.0	982.0	1334.0	1771.0

This chart shows 66% reductions in the weight of aluminum conduit as compared to steel conduit. Result: easier handling, reduction in worker fatigue, lower labor costs.



CHECK the chart . . . aluminum conduit weighs only *one-third as much* as steel conduit!

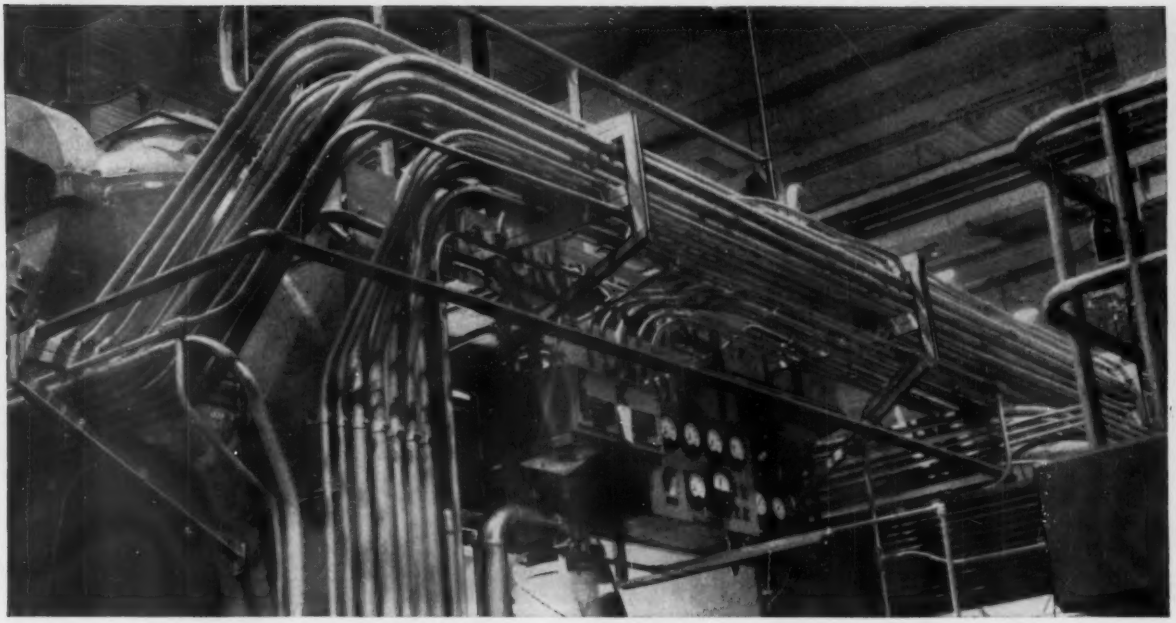
This lighter weight pays off in faster installation with less worker fatigue. Result: lower installation costs . . . with savings up to 50% in some cases!

And here's another cost-saver: lightweight aluminum conduit requires fewer hangers or supports. For large cable-conduit feeders in sizable groups or banks, the number of supports can be greatly reduced. Definite labor savings can be made, especially where supports must be installed in masonry with star drills.

Aluminum conduit's lighter weight pays off in lower handling costs too. For example, standard 10-foot lengths of ¾" steel conduit, usually delivered in groups of five, weigh 53 pounds delivered. Similar aluminum conduit, *delivered in groups of ten*, weighs only 37 pounds.

Corrosion Resistant To Cut Maintenance Costs

The excellent resistance of aluminum to atmospheric



and chemical corrosion has been proved by numerous and extended exposure and laboratory tests, and by countless applications in the process industries.

Aluminum's ability to resist corrosion means that maintenance is virtually eliminated. No painting is needed. Replacement costs are held to an absolute minimum.

And, since aluminum can't rust, cost economies can also be realized in storage. No special storage preparations are necessary.

Nonmagnetic To Reduce Voltage Drop

Because aluminum conduit is nonmagnetic, it is not subject to magnetically-induced energy losses.

This reduction of energy loss permits a longer run of cable without exceeding the voltage drop as specified in the National Electrical Code. In some installations this will permit the use of a smaller size conductor and conduit.

A further advantage is that each conductor in either a single-phase or polyphase system can be enclosed in a separate aluminum conduit, regardless of electrical load. Separate rigid conduits greatly simplify installation of electrical equipment having widely spaced terminals. Terminal overcrowding is eliminated.

Get ALL The Facts Now!

We will be glad to send you an informative 9-page magazine article entitled "Now We Can Specify Aluminum Conduit."

This article contains a complete run-down on the advantages of using aluminum conduit—comparative conduit weights, comparative labor cost charts, installation facts, and much more valuable information.

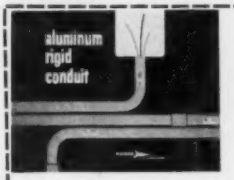
We'll also send our *Aluminum Rigid Conduit* brochure, with installation data, specifications and availabilities for Kaiser Aluminum rigid conduit.

Get *all* the facts about aluminum rigid conduit and how it can save you money. Mail the coupon now!

KAISER ALUMINUM

IF IT CARRIES CURRENT, K/A CARRIES IT!

See Aluminum Conduit featured on "Maverick", Sunday evening, March 15, ABC-TV Network.



Kaiser Aluminum & Chemical Sales, Inc.
Electrical Conductor Division
Dept. 1033
919 N. Michigan Ave., Chicago 11, Ill.

Please send your *Aluminum Rigid Conduit* brochure and aluminum conduit magazine article.

NAME_____

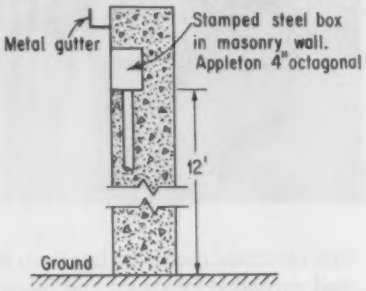
ADDRESS_____

CITY_____ STATE_____

your diagram concerns the 12-circuit panel located in a separate building. According to Section 2525, the grounded circuit conductor serving this building must be connected to a grounding electrode in the building served.—B.A.McD. —3/59/1

Outdoor Fixture Installations

Q. *The sketch shows the outside masonry wall of a building in whi h boxes are to be embedded for the purpose of serv-*



ing weatherproof floodlights. Your answers to the following questions will be appreciated:

1—*Will this stamped steel box, 4-in. octagonal, meet the N. E. Code? The fixture to be mounted is weatherproof with gasket. The box is flush mounted in wall.*

2—*According to the code, is the box in a wet location considering the height and location?*

3—*Could this box be considered exposed?—A.J.B.*

A. According to the provisions of Section 4111, "fixtures installed in damp or wet locations shall be of vaportight or other types approved for such locations and shall be so constructed or installed that water cannot enter or accumulate in wireways, lampholders or other electrical parts. Fixtures installed in corrosive locations shall be of a type approved for such locations."

The provisions of Section 3705 pertaining to boxes reads as follows: "In damp or wet locations, boxes and fittings shall be so placed or equipped as to prevent moisture or water from entering and accumulating within the box or fitting. Boxes and fittings installed in wet lo ations shall be weatherproof, etc."

A wet location is one defined in Article 100 as follows: "A location subject to saturation with water or other liquids, such as locations exposed to weather, washrooms in garages, and like locations, etc."

Question:

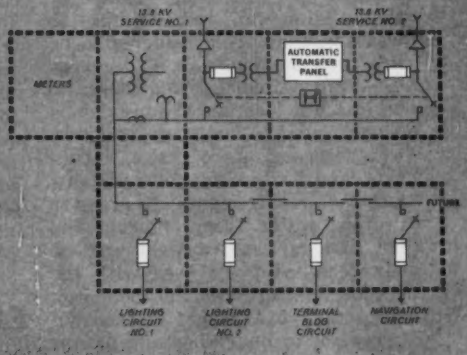
Why did Greater Cincinnati Airport use S&C Metalclad Switchgear in its high-voltage power system?

Answer:

There was *only one answer* to the requirements of maximum reliability, continuity of service, adequate short circuit protection, and full load switching, all at low cost —S&C Fused Load Interrupter Metalclad Switchgear.

Q: Why are power fuses and load interrupters used to replace circuit breakers in this type of switchgear?

A: Because conductors in such installations as this modern airport run in protected underground conduit and tunnels, and are not subject to transient faults caused by trees, wind, or rodents; protection against permanent faults is the only kind needed—and this is provided by S&C Power Fuses.



Q: How is automatic preferred-to-emergency transfer for service continuity provided in this S&C Metalclad Switchgear equipment?

A: By means of an S&C Standard Automatic Transfer Panel used with Moto-Draulic operator, a variety of throwover schemes is available at the flip of a switch. This transfer panel provides for making either source preferred; choice of automatic or manual return; choice of time delay (up to 10 minutes); and optional manual operation of line switches.

Q: Why can S&C offer savings up to 50% in this modern switchgear and still meet the highest standards of quality?

A: Because of the inherent simplicity of the S&C Fused Load Interrupter (compared to complex circuit breaker equipment), savings of 50% and more in the initial cost of switchgear equipment can be realized while the highest quality standards are maintained for the installation.

Q: How can you get information about such switchgear?

A: From S&C sales offices in principal cities. Consult your telephone directory.

S&C ELECTRIC COMPANY
4433 Ravenswood Ave., Chicago 40, Ill.

Specialists in High-Voltage Circuit Interruption for Electric Utilities Since 1910

The provisions of Section 3464 pertaining to conduit and Section 3484 covering EMT requires such raceway systems of wiring, including all boxes and fittings, when used in a wet location, to be so installed and equipped as to prevent water from entering the raceway.

The definition of "exposed" as applied to wiring method, reads as follows: "Exposed means not concealed", and the definition of concealed reads in part as follows: ". . . rendered inaccessible by the structure or finish of the building."

In line with the foregoing code rules and definitions, I would answer your questions as follows:

3—According to the definition of exposed and concealed the box is not "rendered inaccessible" by the structure or finish of the building. As a result it is considered to be exposed.

2—Since the box and fixture is located on the exterior surface of the building wall, and is subject to weather, they are considered to be in a wet location.

1—Since the box is considered to be in a wet location, the provisions of Section 3705 require it to be weatherproof. As a result, a conventional box would not fully satisfy code requirements. In order to prevent water from entering the box and raceway, a weatherproof box designed to be used with the outdoor fixture should be used. Even though a gasket is used between the ordinary box and fixture connection, you will not obtain the reliability provided when weatherproof boxes designed for the fixture are used.—B.A.McD.—3/59/2

Grounding

Q. *Which of the following installations is correct?*

A. The code, seemingly, is not too specific on this point. It is, of course, desirable to tie down the entire system to one definite ground point. This principle is carried out by the utility companies by having one primary and secondary neutral conductor for all their systems and then tying in all the primary and secondary neutral to this one conductor. In effect, this bonds the entire system or systems and tends to keep the potential voltage levels of these systems at the same value

So for Fig. 1 I would of course say that this is most desirable. Quite a few inspectors do require these neutral grounding conductors to be carried all the way back to the service ground point and bonded to the service grounding conductor. This is required for each such transformer installation.

In my opinion, if a good water piping ground is available at the service and this piping system is carried throughout the plant in an approved manner as far as its electrical grounding integrity is concerned, I would say that it would not be necessary to extend the transformer secondary grounding conductors all the way back to the service point. A second ground connection to the interior water piping system near this transformer installation should suffice.—B.Z.S.-5/59/3

EMT—Underground Use

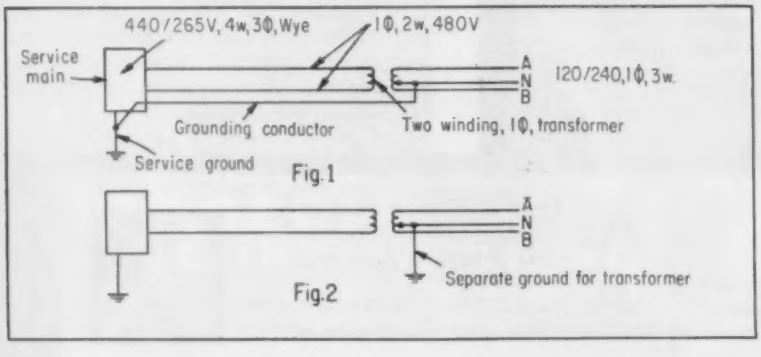
Q. *Section 3482-a of the code prohibits the use of EMT "in cinder concrete or cinder fill where subject to permanent moisture unless protected on all sides by a layer of non-cinder concrete at least 2 ins. thick or unless the tubing is at least 18 ins. under the fill."*

I assume that underground is a wet location and I believe the above wording is misleading. The way I read this paragraph is to insert the word "cinder" before the word "fill" in the first line because if you place tubing 18 ins. below the fill it will still be subject to permanent moisture, but without the supposed danger of the acid in the cinders. I am inclined to feel that EMT should not be used underground under any condition where subject to permanent moisture; however, I feel that if it is so recognized I should go along with it. I hope you can clarify this question.—G.J.

A. According to Article 100 a wet location is defined as follows: "A location subject to saturation with water or other liquids, such as locations exposed to weather, washrooms in garages, and like locations. Installations underground or in concrete slabs of masonry in direct contact with the earth shall be considered as wet locations.

In view of this definition, it is apparent that EMT installed underground is considered to be in a wet location. While it may be a wet location, there is a question with respect to permanent moisture. As an example, Section 2583 of the code requires a rod or pipe electrode to be driven in the ground to a depth of 8 ft, which is considered to be the depth where permanent moisture exists. In some sections of our country permanent moisture may exist a few feet below the surface while in others it may not exist at 8 ft or more below the surface. A review of Section 3482-a indicates to me that the question of "permanent moisture" is only involved when EMT is installed in cinder concrete or cinder fill. Under such conditions it is not recognized since the moisture combines with the cinders to form sulphuric acid which would corrode the EMT. If however the EMT is placed 18 ins. under the cinder fill the corrosive effect is considered to be nullified. It is interesting to note that a similar code provision applies to rigid metal conduit as covered by Section 3463.

Section 3484 recognizes the use of EMT in dairies, laundries, canneries, and other wet locations. Since an underground installation is considered to be a wet location by definition, it appears that there is no question with respect to the use of EMT underground, regardless of permanent moisture, provided cinders are not involved. If the code did not intend to recognize such use, I believe a definite statement to this effect would be made under Section 3482. Official Inter-



Multi-Million Dollar Plant of American Greetings Corporation

goes modern with
3000 DIAMOND I FIXTURES BY SYLVANIA

When American Greetings Corporation built the world's largest single-floor greeting card manufacturing plant in suburban Cleveland, they placed special emphasis on their lighting requirements. For they had found from past experience that faulty lighting often led directly to production inefficiencies and shipping errors.

SYLVANIA'S DIAMOND I SERIES . . .

An ideal fixture to use where critical seeing tasks call for high quality illumination. Meeting or exceeding all RLM requirements for 20%-30% upward component fixtures, the Diamond I Series offers exceptional efficiency with outstanding installation and maintenance features.

The Diamond I Series is now available for use with high output and very high output lamps in addition to conventional Rapid Start and Instant Start models. Write for complete information.

On choosing Sylvania's Diamond I fixtures to light this smooth-running plant, Chief Industrial Engineer Henry Bernbaum states, "We set rigid lighting specifications and the Sylvania fixtures met all of them from every angle. We now have the quality lighting system we need and we obtained it at a reasonable cost."

The next time *you* face a lighting problem in a new plant or old, look first to Sylvania. The wide variety of industrial fixture types offered by Sylvania allows you to choose the particular fixture that suits your application best. No matter which type you pick you'll know you're getting quality fixtures at a reasonable price.

For *all* of your industrial and commercial lighting needs . . . Go Modern with Lighting by SYLVANIA.

SYLVANIA LIGHTING PRODUCTS
A Division of SYLVANIA ELECTRIC PRODUCTS INC.
Department 59-2
One 48th Street, Wheeling, West Virginia

GO MODERN WITH LIGHTING BY **SYLVANIA**

Fluorescent Lighting Fixtures and Systems

BEST FIXTURE VALUE IN EVERY PRICE RANGE

LIGHTING • TELEVISION • RADIO • ELECTRONICS • PHOTOGRAPHY • ATOMIC ENERGY • CHEMISTRY-METALLURGY

pretation No. 444, released January 9th also confirms the above opinion. It reads as follows:

"Question—If ½-in. or ¾-in. electrical metallic tubing is installed in the center of a 4-in. slab of non-cinder concrete in direct contact with the earth, with sand and gravel fill, would this be prohibited by Item 2 in Section 3482 of the 1956 Code?

"Answer — No." — B.A.McD. — 3/59/4

Termination of Uninsulated Conductor

Q. *In a service where you have two 60-amp main disconnect switches where shall the uninsulated conductor stop?—H.D.P.*

A. The conductors are considered service conductors up to the line terminal points on the service equipment. If there is more than one service disconnect switch (with service fuses) or more than one service circuit breaker installed as the main disconnect and overcurrent protection, this uninsulated grounded neutral conductor may be terminated at each line terminal of each service disconnect and overcurrent protective device. —B.Z.S.—3/59/5

Emergency Systems—Unit Equipments

Q. *I would appreciate whatever light you can throw on the following redundancy in connection with Section 7061 in NEC, requiring battery operated emergency units to be permanently connected by flexible cords, on an entirely independent circuit, and in a separate raceway.*

The permanent installation feature is a reasonable requirement to preclude removal, as it might be if merely plugged into a receptacle. I consider it to be "permanently" installed if the cap is removed from box; also, that the unit itself should be firmly mounted, either on the wall, or on a shelf fixed on the wall. I cannot understand why it is required to provide a separate circuit and a separate raceway as referred to in Section 7024, NEC. Since the unit is required to come on automatically and is fed directly from a self-contained trickle-charged battery, its function is dependent

upon fault interruption of the lighting circuit involved. Any receptacle circuit from the lighting panelboard appears to be a suitable means of supplying the battery charging power. Why run separate wiring and raceway for this purpose? Also where should this separate circuit be connected, if required?—J. D.

A. For the benefit of our readers, the provisions of Section 7061 read, in part, as follows:

"Unit equipments shall be permanently fixed in place (i.e. not portable) and shall have all wiring to each unit installed in accordance with the requirements of any of the wiring methods in Chapter 3. They shall not be connected by flexible cords."

It appears quite definite, in view of the foregoing, that an "emergency unit equipment" shall not be connected by a flexible cord. As a result your concept of this code provision is, in my opinion, a false one. You could not use a cord with a cap for connection to a receptacle, or you could not remove the cap and connect the cord direct to the wiring circuit, without violating the provisions of Section 7061.

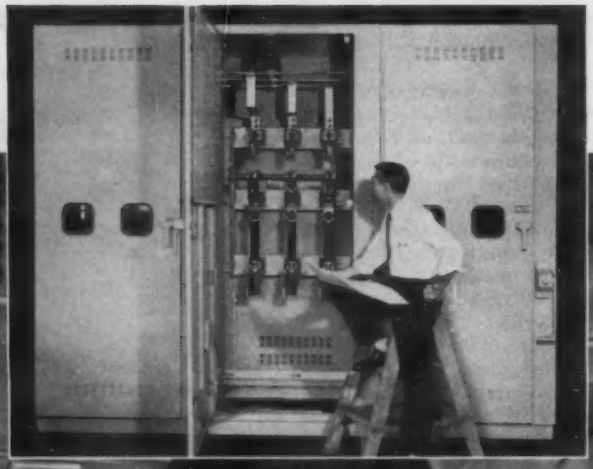
The fact remains however that some types of automatic emergency lighting units are available with cord and plug, while others are designed for permanent installation whereby the wiring method used is brought direct to the unit. It is significant to note in this respect that the provisions of Article 700 only apply when emergency systems are required by municipal, state, federal or other codes, or by any governmental agency having jurisdiction. In the absence of any such laws or codes, unit equipments may be installed by the use of a cord and receptacle. There also may be occasions where the law does not specifically cover a particular application which the electrical designer believes should be covered. In such instances, he may use his own discretion with respect to the application of code rules covering emergency lighting. It appears to me however, when the engineer or architect assumes the responsibility for emergency lighting or power, that it would be a good policy to at least satisfy the minimum requirements of the NEC.

Your observation with respect to the sentence of Section 7061, which reads as follows, is interesting;

"The supply circuit between the unit equipment and the service, feeders, or the branch circuit wir-

S&C metalclad switchgear

Typical S & C High Voltage Metalclad Switchgear Unit. Assembler, below, installs section of Reynolds Silver Plated Aluminum Bus.



production runs smoother with REYNOLDS ALUMINUM Silver Plated Bus Bar

Design and Appearance Improved . . . Forming, Sawing, Punching Simplified

S & C Electric Company, Chicago, Illinois, finds Reynolds Silver Plated Aluminum Bus Bar ends bothersome and costly production problems . . . and provides extra plus benefits too!

First, Reynolds Silver Plated Bus Bar needs no preparation, painting or masking before fabrication. The bar is simply taken from stock and put right into production.

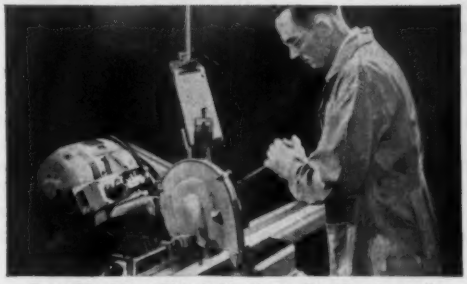
Second, aluminum is exceptionally easy to fabricate. And, the silver plating . . . designed and quality controlled by Reynolds . . . never peels or chips around the work edges in punching, forming or sawing.

Reynolds Silver Plated Bus Bar contributes to the attractive appearance of S & C metalclad switchgear available for both indoor and outdoor high voltage applications. And, S & C obtained all these advantages without changing from previous enclosure size standards.

Lower in cost than equivalent copper bar, Reynolds Silver Plated Aluminum Bus Bar requires no prior preparations, provides simple, inexpensive and reliable connections. It's the first commercially available plated aluminum bar with established quality standards! It meets *all* electrical code requirements.

These are just a few of the reasons why aluminum is being used more and more in modern electrical distribution systems.

For details and availability data, write today for the new brochure, "Reynolds Silver Plated Aluminum Bus Conductors", *Reynolds Metals Company, P. O. Box 2346-ET, Richmond 18, Virginia.* For assistance from Reynolds Engineering Service call your nearest Reynolds office or write to the above address.



Reynolds Silver Plated Aluminum Bus Bar is easily sawed, yet the plating never peels or chips.

Punching thick aluminum bus bars is a simple fabrication job—and the plating remains in perfect condition.

Silver Plated Aluminum Bus Bar is readily formed on existing equipment.

REYNOLDS ALUMINUM

Watch Reynolds new TV shows—"WALT DISNEY PRESENTS" and "ALL-STAR GOLF"—every week on ABC-TV.

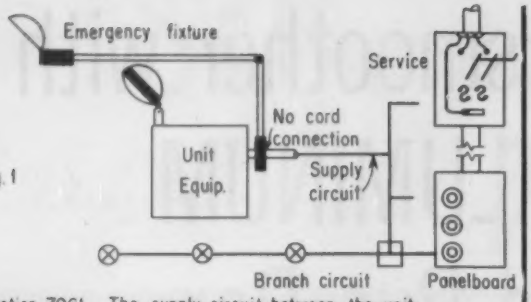


Fig. 1

Section 7061. The supply circuit between the unit equipment and the service, feeders, or the branch circuit wiring shall by installed as required by section 7024.

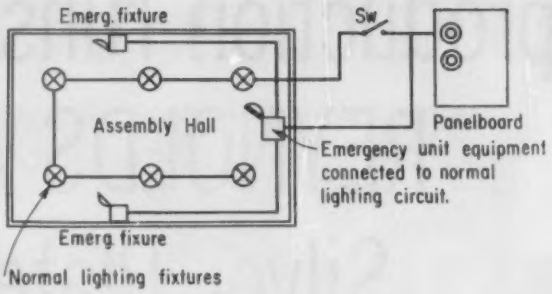


Fig. 2

ing shall be installed as required by Section 7024."

Section 7024 reads as follows:

"Independent Wiring. Emergency circuit wiring shall be kept entirely independent of all other wiring and equipment and shall not enter the same raceway, box or cabinet with other wiring except in the case of transfer switches or exit and emergency lights supplied from two sources or as otherwise permitted in this Article."

A literal interpretation of the provision of Section 7061, quoted above indicates that the supply circuit may originate at the service, at a feeder, or some place on a branch circuit as shown by Fig. 1; and the resulting circuit or part of a circuit must comply with the independent wiring provisions of Section 7024. If this concept of the rule is correct, the occasion for a separate branch circuit, which you question, is eliminated. In fact, I am inclined to believe, when unit equipment is used for emergency lighting, that the adequacy of such equipment is greatly improved when the emergency unit is connected to the lighting circuit which it supplements when a power failure exists for any reason on the wiring system. In support of this opinion the emergency unit will function under all of the following conditions:

1—When the source of supply to the building fails.

2—When the service ove current devices operates.

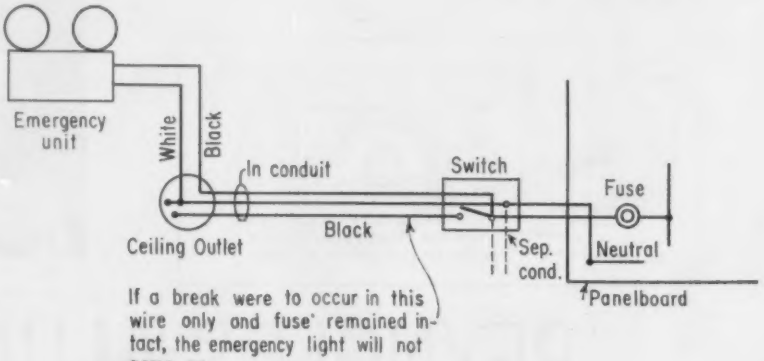
3—When the feeder overcurrent device operates.

4—When the branch circuit feeding the area to be protected fails to function.

In other words, any interruption of power to the circuit serving the area where emergency lighting is required, will cause the emergency unit to function automatically. As an example, a small restaurant or an assembly hall, as shown by Fig. 2, will be provided with emergency lighting whenever a current failure occurs on the exterior or interior wiring system. If however the emergency unit was connected to a separate circuit taken from the main switch, a fault on a feeder or a branch circuit serving the emergency area would in no way influence the operation of the emergency unit. In other words the assembly hall would be in darkness while the owner endeavored to replace a fuse or correct the fault. If however the emergency unit was manually operable, emergency lighting could be obtained if a ladder was available and someone knew how to operate the unit. If the emergency unit was supplied through a separate circuit at a panelboard, which did not supply the lighting circuit feeding the emergency area, a similar situation would prevail when a feeder or a branch circuit fuse opened the circuit feeding current to the normal lighting system. If the emergency unit was served through a receptacle circuit, as you suggest, the unit would fail to function when the circuit providing the normal lighting became inoperative due to a fault, the opening of an overcurrent device, etc.

The objective of an emergency system, as covered by Section 7001 is to supply illumination and power in the event of failure of the normal supply or in the event of accident to elements of a system supplying power and illumination essential for safety to life and property. When the emergency source of supply is derived through any of the methods covered by Sections 7012 through 7015, it is essential that the emergency wiring system be isolated from the normal wiring system, in order to minimize the simultaneous interruption of both systems. As an example, emergency lighting circuits run in the same conduit and boxes with normal circuits, would be subject to the destructive faults occurring on the normal circuits. Such faults could result in fire, and both circuits could become inoperative at the same time.

A summary of the foregoing in-



Editor's Comment: Such a degree of safeguard is not considered by the Code.

Fig. A

What do you look for FIRST in Power Roof Ventilators?

IS IT CAPACITY?

Look first to Ilg for propeller fan power roof ventilators and you'll find the size that's rated for your needs. No reason to put up with either *more* or *less* ventilation than you want.

Ilg offers 11 different sizes for exhausting as little as 87 c.f.m. . . . as much as 21,100 c.f.m.—at static pressures from 0" to 5/8".

Lifetime, low-in-height aluminum housing . . . solid, heavy-gauge construction . . . withstand weather and wind. Leakproof.

IS IT PERFORMANCE?

Look first to Ilg for quiet, vibration-free performance. Ilg-built direct-connected, patented "Q" Type fan wheel and totally enclosed, constant and 2-speed motors assure smooth flow of power. No belt noise or slippage. Little friction loss. Low bearing wear.

Low-starting torque subjects permanent-split capacitor single-phase motors and 3-phase motors to less initial shock . . . lengthens motor life.

Fan design passes air over blade smoothly and quietly, eliminates noisy turbulence. Ilg "One-Name-Plate" pledge of performance covers both the dynamically balanced fan wheel and permanently lubricated motor.

For further information, write for Bulletin 2302.

ILG

ILG ELECTRIC VENTILATING COMPANY
2879 N. Pulaski Road, Chicago 41, Ill.
Offices in 57 Principal Cities

Member of Air Moving and Conditioning Association Inc. (AMCA)

dicates to me that the maximum assurance of emergency lighting may be obtained when the unit equipment is connected to the branch circuit which serves the lighting in the emergency area. While a literal reading of Section 7061 does not require such a connection, I am inclined to believe that it does not deny the use of such procedure.

In reply to my observation with respect to this subject, J. D. advises that "Lighting panelboards in our design are required to be circuit breaker type, and in large areas, like assembly halls and shops, the lights are usually controlled at the panelboard, thus making it virtually impossible to effectively connect the emergency circuit to a branch lighting circuit. Where a room has several lighting circuits, obviously, only one of them need be tapped."

It appears evident from the foregoing that an emergency unit should not be connected to a circuit protected by a circuit breaker, when such a breaker is used to control the lights connected to the circuit. It would be possible however to install a switch as shown by Fig. 2 in addition to the breaker and use this as the means of control. If anyone inadvertently used the breaker to disconnect the general lights, the emergency lighting would automatically go on. A few occurrences of this nature would impress the people concerned that the switch should be used. In other words the circuit breaker would act only as an overcurrent device the same as a fuse.

Another question raised by J. D. follows: "Referring to your diagram, Fig. 2, whether the connection is made in the switch box, or in the panelboard, would it not violate Section 7024 pertaining to the same 'box or cabinet' requirement? I am confused. Why then would it not be satisfactory, although not complying with Section 7024, to run one additional wire in the same conduit to pick up a 'separate circuit' with a common neutral of the same branch lighting circuit at the nearest ceiling outlet, as indicated in Fig. A.? This method would work for fused tumbler switch arrangement, but if a break were to occur in the "hot" leg of the switch wire and the fuse remained intact, obviously the emergency lights will remain dark. If you will clarify the above, it will be appreciated."

The illustration shown by Fig. 2 intends to emphasize the need for connecting the emergency unit ahead of any switch which controls lighting units. I do not believe there is any violation of Section 7024 regardless of the location of the switch within or outside the panelboard. The provisions of Section 7061 tells us that "the supply circuit between the unit equipment and the service, feeders, or the branch circuit wiring shall be installed as required by Section 7024." My interpretation of this rule is that the emergency wiring originates where it is connected to the branch circuit, and from that point on it shall be independent of other wiring and equipment etc.

In view of the foregoing, there appears to be a violation of Section 7024 when the emergency conductor serving the unit is run in the same conduit with the conductors serving general lighting as shown by your Fig. A. As a result, it would be necessary to run a separate conduit to the emergency unit as shown by Fig. 2.

In connection with Fig. 2, it appears evident that if the circuit serving the general lighting becomes open due to a fault which does not blow the fuse, or someone inadvertently opening the switch, that the emergency unit will not function. It will however function when the current to the circuit is interrupted due to an interruption of the service to the building, when the service overcurrent device operates, when a feeder fuse blows or when the branch circuit fuse blows. Such a degree of protection is, in my opinion, greater than required by the code.

When a room or hall is served by more than one circuit, serving lights which must be used when the hall is occupied, the significance of a connection to one of the circuits is discounted since the failure of one circuit would not leave the hall in darkness. Even under such conditions, I believe it would be desirable to have the emergency unit connected to one of these circuits as shown by Fig. 2. Such a degree of safeguard however is not, in my opinion, required by the code since the emergency unit could be connected at the service or a feeder as intimated by Section 7061.

The following comment received from H. H. Watson, Chairman of Panel No. 2, appears to verify the foregoing comment:

"Your reply to J. D.'s question on emergency lighting unit equipments sounds good to me. For what they are worth, here are a couple of 'remarks':

"1—Even if cord-connected, the presence of unit equipments in a place of public assemblage is of great value in providing illumination at times of power outages. For safest operation the unit should be

premanently wired, of course.

2—In lieu of supplying the unit equipment control circuit ahead of a single branch circuit lighting control switch, an alternate arrangement is to use at least two branch lighting circuits in the protected area and connecting the unit equipment into a feeder supplying the branch circuits.

"In small areas where a single point of switch control is desired the switch can be a double-pole snap switch with one pole in each circuit."—B.A.McD.—3/59/6

Uninsulated Current Carrying Conductor

Q. *Under what conditions may an uninsulated current-carrying conductor be pulled in the same pipe with insulated conductors?—H.D.P.*

A. The present code (1956 NEC), in general, permits the use of "a grounded service conductor without insulating covering" in Section 2303a for installations having a nominal voltage to ground of not more than 300 volts. This includes service entrance conductors and service drop conductors.

The proposed 1959 Code will have this same permission listed as a general EXCEPTION to the requirements of Section 230-4, "Insulation of Service Conductors." Furthermore, specific reference will be made in this exception to Section 230-22, Service Drops, Section 230-30, Underground Services and Section 230-40, Service Entrance Conductors.

Section 230-22 and Section 230-40 will more or less repeat this general exception for the service drop and the service entrance conductors. Section 230-30 will further limit the use of the uninsulated grounded neutral conductor in the case of underground installations.

First off, the uninsulated grounded neutral may be of aluminum or copper and may be installed underground when this uninsulated grounded neutral is part of an approved cable assembly. If a bare grounded neutral conductor is installed underground it shall be of copper and shall be installed in duct or conduit.

An uninsulated or bare grounded neutral conductor (current carrying neutral) installed as a part of the service conductors shall be installed in the same conduit with the other insulated service conductors. —B.Z.S.—3/59/7

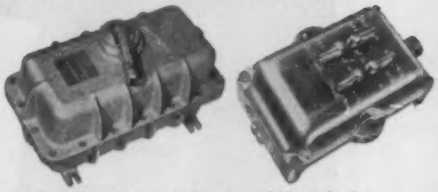
When you install *be sure to use Killark*

. . . the *first* and most complete all-

MOTOR STARTER ENCLOSURES
Explosion-Proof, Dust-Tight, Weatherproof

Starters and Combination Starters Made to Order

CIRCUIT BREAKER ENCLOSURES
Explosion-Proof, Dust-Tight, Weatherproof



Furnished Complete with Breaker of Your Choice

JUNCTION BOXES
Explosion-Proof, Dust-Tight, Weatherproof

More Than 40 Sizes Custom Hubs

PANEL BOARDS
Explosion-Proof, Dust-Tight, Weatherproof

Completely Wired—Ready to Install

ENJOY THE *Plus* ADVANTAGES OF A *100%* ALUMINUM INSTALLATION!

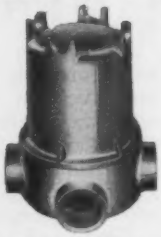
- **Lightweightness.** You save labor, cut transportation and handling charges. Aluminum weighs ⅓ as much as iron; one man can handle an all-aluminum installation which may have required two men when other metals are used.
- **Ease of Installation.** Aluminum conduit bends without collapsing, shapes up quickly. Killark fittings have clean threads and plenty of wiring room—and are designed for easy installation.
- **Non-Sparking.** An important safety factor in hazardous areas.
- **Non-Rusting, Non-Corroding.** Exclusive Killark aluminum fittings are long on life, short on maintenance. Smooth, bright, clear-through durability; they never rust and are more corrosive resistant than other types.

Make your next installation an *all* aluminum one—aluminum conduit and 100%-aluminum Killark fittings. The best costs less in the long run.

INSTRUMENT BOXES
Explosion-Proof, Dust-Tight, Weatherproof

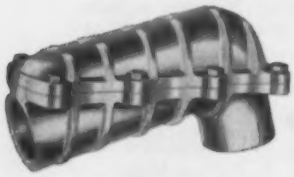
Several sizes Glass Lens Covers Available

SPLICE BOX Explosion-Proof



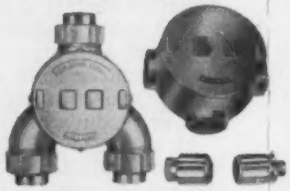
Available 1¼"—1½"—2" with Various Hub Styles

PULLING ELBOW
Explosion-Proof



Very Rugged Construction Various Sizes

FITTINGS Explosion-Proof



Complete Line of Fittings & Accessories

Killark

KILLARK ST. LOUIS

ELECTRIC MANUFACTURING COMPANY

Vandeventer and Easton Aves. • St. Louis 13, Missouri

Aluminum Conduit...

ALUMINUM FITTINGS AND FIXTURES

aluminum line!

JUNCTION BOXES
Explosion-Proof

Screwcap Style
Many Sizes—Custom Hubs

DUST-TIGHT FIXTURES

Available in
Pendant,
Bracket &
Ceiling Types
100W—150W—200W

VAPOR-PROOF FIXTURES

Pendant,
Ceiling,
Bracket Types.
60W to 500W.

EXPLOSION-PROOF FIXTURES

Available in
Pendant,
Bracket &
Ceiling Types.
60W thru 500W.

FLUSH SWITCH FITTINGS
Single thru 5-Gang
Shallow &
Deep Styles

ENTRANCE FITTINGS
Threaded and Speedolet Types

½" thru 6"

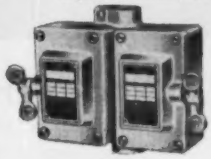
...AND ENJOY THE *Completeness* OF THE KILLARK LINE!

Whatever the installation, Killark can provide the correct aluminum fitting or fixture. That's because Killark has been supplying the electrical needs of contractors for over 45 years. In 1942, Killark pioneered the use of aluminum and now manufactures exclusively the *only* complete line of aluminum fittings and fixtures. *They cost no more than malleable iron fittings.*

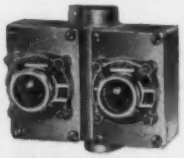
There are thousands of fittings in the constantly expanding Killark line. Many years of research, design and development are your assurance of the finest aluminum fittings at the lowest possible cost. Fast delivery is assured through convenient warehouse stocks in many cities.

THE KILLARK ILLUSTRATED CATALOG IS YOURS ON REQUEST

SWITCHES—PILOT LIGHTS
Explosion-Proof, Weatherproof



Switch



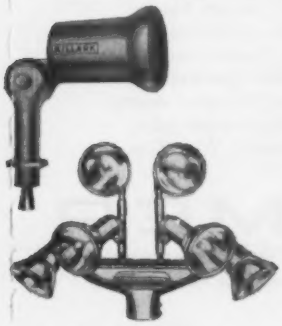
Pilot Light

Single and 2-Gang

PLUGS & RECEPTACLES

Complete Line
Explosion-Proof
and Weatherproof

CLUSTER LIGHTS



150W to 500W.
Versatile in Design

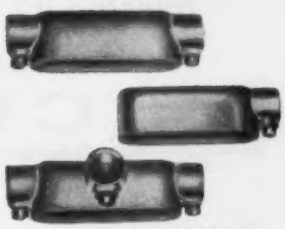
KILLARK REPRESENTATIVES

*Atlanta, Ga.
Baltimore, Md.
*Boston, Mass.
*Buffalo, N. Y.
*Chicago, Ill.
*Cincinnati, Ohio
*Cleveland, Ohio
*Dallas, Tex.
*Denver, Col.
*Detroit, Mich.
Kansas City, Mo.
*Los Angeles, Calif.
Milwaukee, Wisc.
Minneapolis, Minn.
New York City, N. Y.
Omaha, Neb.
*Philadelphia, Pa.
*Phoenix, Ariz.
*Pittsburgh, Pa.
Richmond, Va.
*San Francisco, Calif.
*Seattle, Wash.
Honolulu, Hawaii

Sales Offices and Warehouse Stocks throughout Canada

*Warehouse Stocks

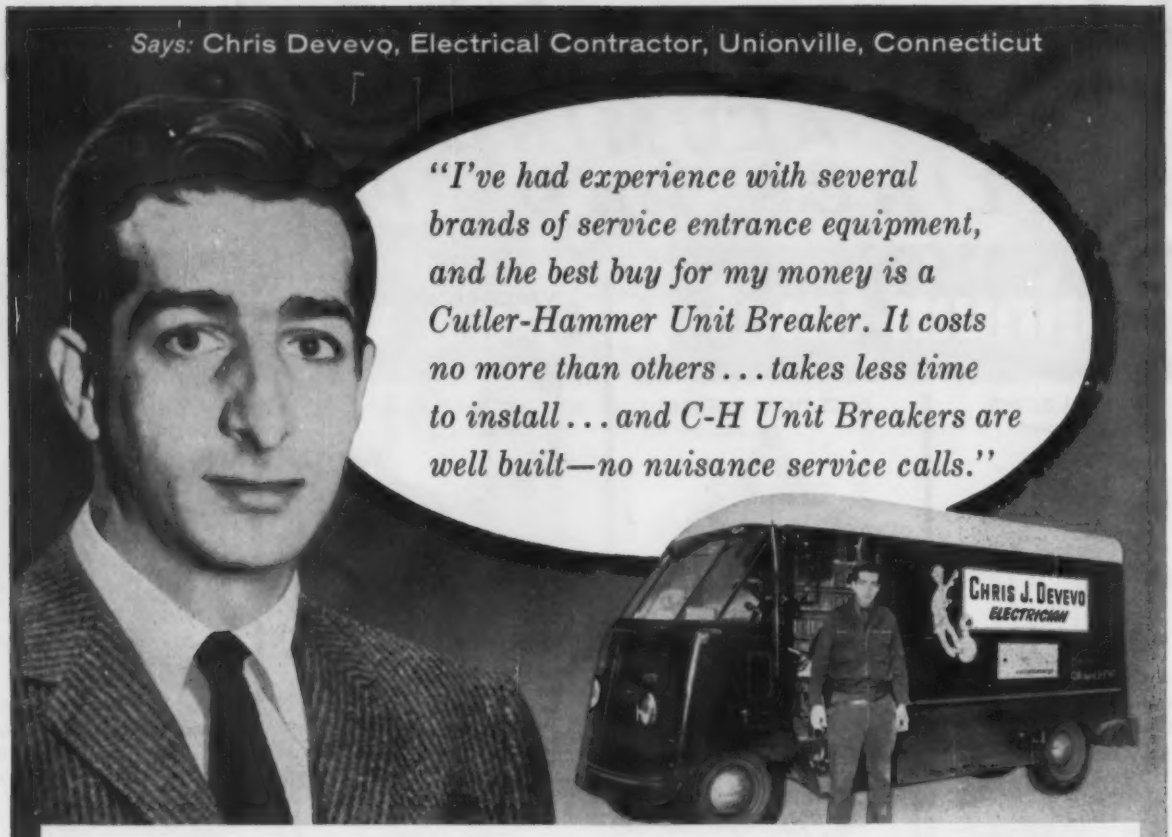
SPEEDOLETS



For Thinwall Conduit
All Sizes thru 2"

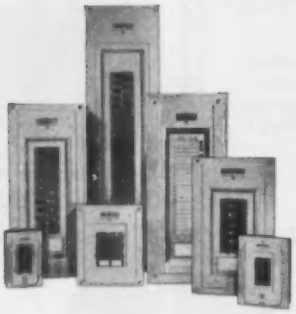
Vandeventer and Easton Aves. • St. Louis 13, Missouri

Says: Chris Devevo, Electrical Contractor, Unionville, Connecticut



Thousands of Contractors use C-H Unit Breakers

KNOW THE FACTS!



You won't lose profits on service complaints, you won't have unhappy customers, if you buy circuit breakers on performance, *not* on claims. That's what thousands of profit-minded contractors will tell you about C-H Unit Breakers.

C-H breaker performance pays off the same way on large as well as small jobs. Prominent housing projects across America are C-H Unit Breaker equipped, to the satisfaction of builders, contractors and home owners.

For customer satisfaction and full, steady profit, performance points to Cutler-Hammer as your choice in breakers, and 568 Authorized Cutler-Hammer Distributors will agree with you on that choice!

There's a difference... Are you missing it?

The "package" may look the same on good watches and not-quite-so-good ones. The same goes for circuit breakers. But the difference shouts at you when you buy on performance, *not* on looks and claims. Successful contractors—thousands of them—find that the performance of C-H Unit Breakers amounts to an extra "edge" that insures customer satisfaction and betters their business. Get that extra edge for yourself—feature C-H Unit Breakers! See your nearby Authorized Cutler-Hammer Distributor, or write for the new selection guide, *Handi-Log*, Pub. MS33-F241. Cutler-Hammer Inc., Milwaukee 1, Wisconsin.

CUTLER-HAMMER CONTROL C-H

CUTLER-HAMMER

Cutler-Hammer Inc., Milwaukee, Wis. • *Division:* **Airborne Instruments Laboratory.** • *Subsidiary:* **Cutler-Hammer International, C. A.**

Associates: Canadian Cutler-Hammer, Ltd.; Cutler-Hammer Mexicana, S. A.; Intercontinental Electronics Corporation.

Data Sheet

Electrical Rehabilitation for Flooded Areas

A summary of tested and proved ideas for fast, effective recovery of electrical operations in areas hard hit by floods—based on actual case studies of this unusual problem.

A—ORGANIZING FOR FLOOD REPAIR

1—Set up temporary drying and cleaning operations in plants and/or warehouses, under the direction of special maintenance employees.
2—Where possible send key men to plants merely to supervise the construction of temporary enclosures, in order to maximize their usefulness.
3—After getting large machines on "bake" in various plants, a regular schedule of inspection can be followed and periodic insulation tests conducted and charted, while the drying-out temperatures are also checked.
4—Have customers dismantle and haul their own equipment. When dismantling help is needed by a plant, the work can be done by wiremen, keeping all experienced shop mechanics busy on reconditioning work. When equipment is ready for delivery, follow the same procedure, wiremen being used where needed to set and connect the reconditioned motors and controllers.
5—Use cat-booms to bring units to cleaning platforms where water and steam is used to wash out caked mud.
6—Production-line set up begins at cleaning area. Following steam cleaning, motors enter building on conveyor; go through baking, assembly, testing and painting at rate of 100 per day.

B—POWER AND LIGHT FOR FLOOD REHABILITATION WORK

1—Lack of power necessitates installing temporary lighting or illumination of battery flashlights for working 'round-the-clock inside industrial plants, commercial buildings and residences to clean and rehabilitate flooded equipment.
2—Connect temporary transformer banks and mobile m-g sets wherever continuity of service is imperative (as in hospitals).
3—When on-the-spot repairs cannot be performed with certainty, submerged equipment such as meters, breakers, controls, starters and motors should be removed for thorough cleaning and repair at the shop.

C—DRYING TECHNIQUES FOR ON JOB AND IN SHOP

1—Use heavily constructed motor storage racks provided with steam unit heaters.
2—Use a traveling electric hoist to stack motors on the shelf levels of racks.
3—Use temporary metal frames and sheets of tin to build large coke-heated ovens.
4—Arrange for temporary use of large ovens in industrial plants to dry out apparatus.
5—Ovens can be made of asbestos board and lumber frames, using steam coils and fans for circulated air drying.
6—Use strip heaters to maintain a temperature of about 110° C in large ovens.
7—Drying equipment on customer's premises may range from tarpaulin enclosures and salamanders to sectionalized metal ovens equipped with gas heaters.
8—Remove large wound rotors and armatures from their machines and set within enclosures on blocks so that hot air can be properly circulated.
9—Remove wet pole winding from dc motors and generators and send to shop for reconditioning.
10—Metal hopper on its side will form an oven to dry out motors. Portable oil-burning heater blasts hot air through neck of hopper at rear. Rack holds motor parts.
11—Use heat lamps to dry out cable terminals at bank of starters. Remove starters and send to manufacturer's service station for repair.

DATA SHEET [Continued]

D—CLEANING METHODS FOR WATER AND MUD-LOGGED

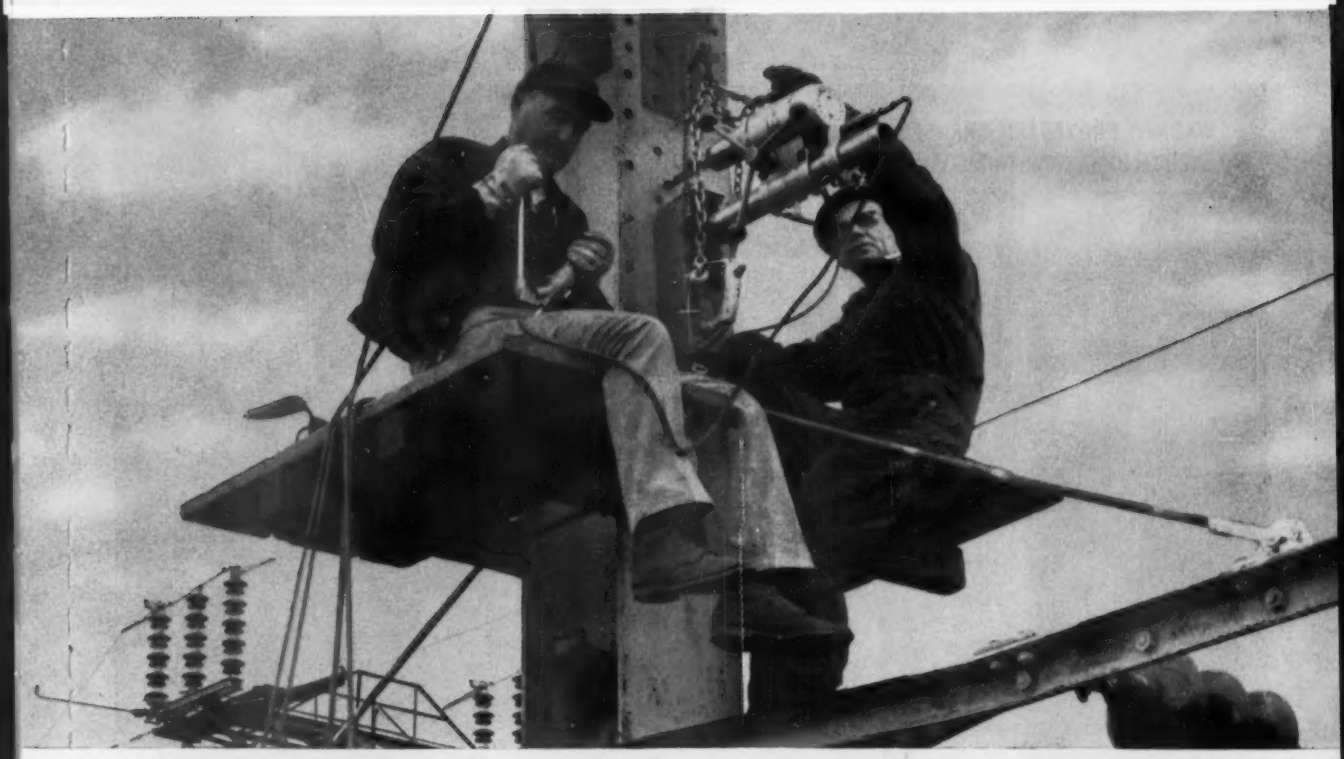
1—Use compressed air to force water and silt out of conduits.
2—Carbon tet spray helps clean and dry motor starter terminals and contacts. Sealing fittings prevents excessive silt from entering starter.
3—Properly tag incoming equipment and separate into four cleaning operations:
  a—Prepare stators, armatures and other parts having insulated coils, for the drying ovens.
  b—Check for new bearings needed.
  c—Clean all metal parts such as end frames, bases, oil reservoirs, controller cases.
  d—Determine whether any contacts, fibre washers, wood sleeves or rods, or other controller parts are required.
4—Clean windings of loose mud and sludge with warm water applied under moderate hose pressure.
5—Clean off grease and oil by using gasoline and other solvents, applied with fibre brushes and rags.
6—Loosen commutator clamping rings to drain off water that has seeped in under the commutator.
7—If necessary puncture the insulation layers of field coils of dc motors and generators to dry satisfactorily.
8—Small coils on controllers are usually free of dirt because of their enclosures. However, they may have to be removed from their equipment and dried out. Some types of control equipment can be dried without removing any of the coils from their panels, after having been washed down with a hose.
9—Oil and grease can be removed from all bearings with gasoline and other solvents. Replace old oil in circuit breakers, autostarters and relay dashpots.
10—Sometimes wood and fibre separators can be used again after being dried.
11—Wet motors can be baked before taking them apart, blowing them clean with dry compressed air. Windings are then re-varnished.
12—Compressed air can also be used for blowing out controls, bus ducts and conduit runs, after salt or brackish water has been flushed away by steam, by boiling or by flushing with hot fresh water, or by spraying with carbon tet or naptha products. Carbon tetrachloride and various naptha products can also be used for scrubbing busbars and other oil-gummed equipment. And, depending upon Megger readings, length of time the units were submerged and similar factors, many motors will also have to be reinsulated.

E—TESTING AND INSULATION

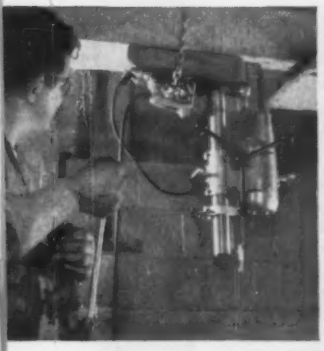
1—An insulation resistance value of 500,000 ohms to 1 megohm is the usual range for dry stator windings. The minimum value for most motor and generator insulation, based on normal operating temperature, is: Megohms equals Rated Voltage divided by (Rated kva plus 1,000).
2—Air drying varnish is generally used for reinsulating windings of low voltage equipment. Because coil mass is already preheated from drying operation, a good penetration is assured.

F—THINGS TO KEEP IN MIND (Mistakes from past work)

1—Costly mistakes were made after floods, in operating partially dry equipment which caused the loss of good windings.
2—In the anxiety to get going, some equipment was severely overheated in crude ovens.
3—Much equipment was sent to motor shops for rewinding, which showed such evidence as blued shafts, charred insulation, and grounded coils.
4—Customers admitted their error came from haste and a lack of regard for the damaging results of improper handling.
5—Flood repairs are usually handled under difficult, chaotic conditions. An orderly job handling procedure, however crude, and one or two of the more diplomatic and even tempered men to handle customer contacts can save valuable time and build tremendous good will.



Job hard-to-reach, hard-to-handle?
Send for a B&D Magnetic Drill Press!



B&D 1¼" MAGNETIC DRILL PRESS works high overhead upside down; enables maintenance man to get into tight spots easily, rapidly.

TAKE 'EM ANYWHERE you need a drill press. Both are light weight, easily transported, simple to put to work; move to the next job.

B&D 1¼" MAGNETIC DRILL PRESS works upright on huge Air Chuck drilling and tapping; ready for instant moving to next operation.

B&D CADDY CART is the perfect way to transport your Magnetic Drill Press from job to job. Prevents damage to this peak precision tool.

Save hours . . . even days on every job . . . one use may pay for the tool!

Whether your job is production, construction or maintenance, a Black & Decker Magnetic Drill Press sticks like glue to the job. Lets you stand off and guide the bit from a distance. And it takes just finger-pressure to drill even a 1¼" hole with Black & Decker's exclusive Hydra-power Feed.

See one on your work. Two sizes to choose from: ¾" and 1¼"; both complete precision units—not attachments. Perfect for drilling, reaming, tapping in tool shops, steel fabricating, maintenance—anywhere you need a drill press but can't take the work to the tool.

Leading Distributors Everywhere Sell

Black & Decker®

Quality Electric Tools . . . Power-built for top performance

THE BLACK & DECKER MFG. CO.
Dept. 1203, Towson 4, Maryland

- ☐ Please arrange a demonstration of your ☐ 1¼"; ☐ ¾" Magnetic Drill Press
- ☐ Send me additional information
- ☐ Send me information on the tools checked below.

Name.....Title.....

Company.....

Address.....

City.....Zone.....State.....

☐ Impact Wrenches

☐ Hammers

☐ Belt Sanders

☐ Drills

☐ Impact Wrenches ☐ Hammers ☐ Belt Sanders ☐ Drills

Motor Shops

PEDESTAL CLAMP holds large motor coils upright for "rolling" insulation on coil straight-away. Foot pedal opens jaws against force of compressed spring around upper jaw shaft.

COMPRESSED SPRING around upper jaw shaft forces clamp jaws together. When upper section is coupled, shaft telescopes into pedestal and rests on foot pedal. Slot pin keeps jaws aligned.

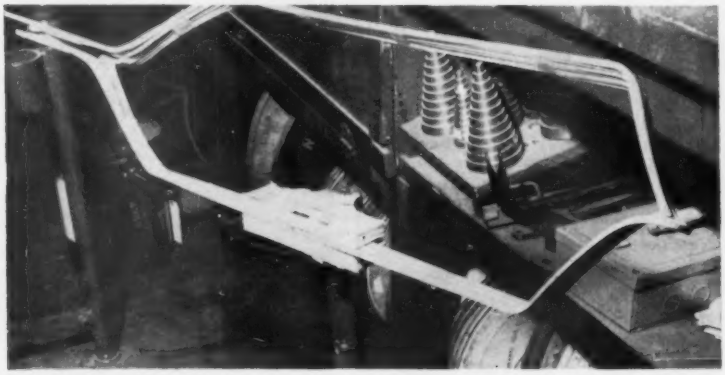
Pedestal Clamp Holds Large Coils

Foot-operated pedestal clamps with spring-actuated jaws hold large coils securely in position for "rolling" varnished cambric insulation on the coil straight-away in the large motor department of Electrical Engineering & Equipment Company, Des Moines, Iowa. Foot control frees both of the operator's hands to apply the insulation and shift the coil when necessary, effecting a substantial time economy in the insulating process.

A typical clamp assembly consists of a two-piece pipe pedestal flange-mounted to the floor. The lower section is a 30-in. length of 1¼-in. pipe with a foot pedal near the base. The top section is a 7-in. length of 1¼-in. pipe with a reducing coupling (to fit the 1¼-in. base) at the bottom and the lower, stationary clamp jaw at the top. Passing through this jaw is a long 1-in. diameter steel shaft supporting the movable (top) jaw of the coil clamp. A horizontal pin, riding a vertical slot in the top pedestal section, keeps upper and lower jaws aligned. From the reducing coupling down, the lower section of the shaft is encircled by a long, heavy coil spring. Retention collars at coupling and shaft base keep the spring under sufficient compression to securely lock the clamp jaws together.

When the top of the pedestal is coupled to the bottom section, the shaft telescopes in the pipe and rests on the foot pedal extension. Pressure on the pedal compresses the spring and raises the shaft to open the coil clamp. When the pedal is released, the spring pushes the shaft, and upper clamp jaw, downward to securely grip the coil.

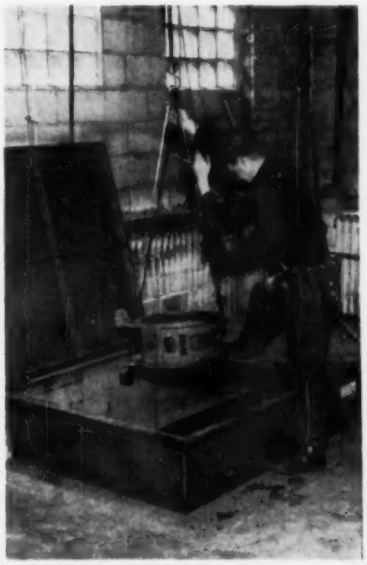
Jaws for the larger of the two coil clamps are 6 ins. long and 1½ ins. wide; are made of ¼ in. steel stock; have a maximum opening of approximately 1¼ ins. to accommodate thick coils.



CLAMP JAWS are long, wide and flat to grip coil-turns in vise fashion. Lower jaw is stationary; upper one opens to a maximum 1¼ in. gap.

Tank Loading Easy With Floor Degreaser

Equipment cleaning and handling methods are two of the many shop operations under constant review in an effort to increase large motor repair department efficiency at Lima Armature Works, Inc., Lima, Ohio. A combination of both time-saving factors resulted from the recent installation of a large vapor-degreasing unit in the Lima shop. Except for loading and unloading the tank, the degreasing operation needs no manual attention. Even this chore has been made easier by installing the tank in the shop floor



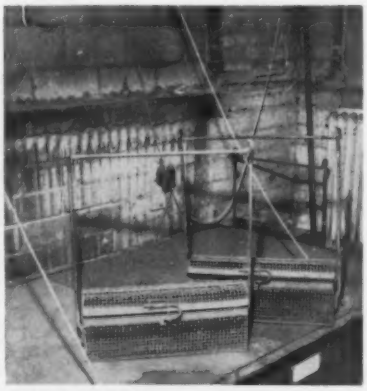
EASY LOADING and unloading is a time-saving feature of this 192-cu-ft sunken vapor detergent tank. One man can raise or lower sectionalized cover with pully-supported ropes.

TANK INTERIOR showing parts resting on supporting rails just above liquid level. Cold-water cooling coils confine vapor to bottom half of enclosure; speed vapor condensation at end of cleaning cycle.

with only about 15 ins. extending above floor level. Equipment is rolled into the area on shop dollies, raised by electric hoist and lowered into the tank.

The rectangular steel tank is 8 ft long, 4 ft wide and 6 ft deep. Almost 5 ft of the tank extends into a basement area where it is heated by a direct-flame, automatically controlled (thermostat) gas burner. Vent space around the tank is covered with a rim of expanded-metal grating flush with the floor. The hinged cover for the 8 ft tank is divided into two 4 ft square sections, each flanged for a tight fit and operated by a pulley-supported rope. Sectionalizing the cover makes it easier to raise and lower the units and only one need be used for small equipment.

A metal grid supports the parts to be cleaned about 6 or 7 ins. above the bottom of the tank—just above the level of the detergent. About



WIRE BASKETS are used for most small parts to be degreased. Filled baskets rest on supporting grid in tank like large motor parts.

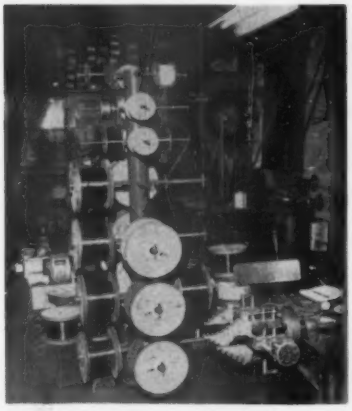
150 gallons of Perchlorethylene is the volatile cleaning agent in the tank. As the liquid is heated, it vaporizes forming a heavier-than-air detergent fog blanket which engulfs the equipment and rises until it hits a cold-air layer about 3 ft below the tank rim. Here, six parallel rows of 1-in. cold water pipes ring the interior perimeter of the enclosure. These coils keep the top of the tank several degrees cooler than the rest; confine the vapor blanket to the lower half; accelerate vapor condensation when the cleaning cycle is finished.

Stators, end bells and relatively large motor parts are set directly on the supporting grid. Small parts, that would fall through the parallel-bar grid, are placed in rectangular mesh-wire baskets with hinged wire covers. Filled baskets are lowered into the tank like the larger parts.

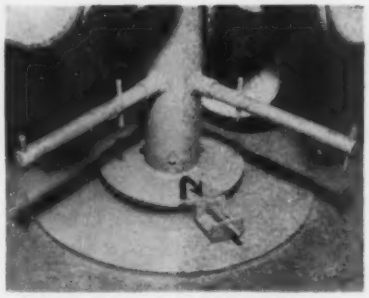
Reel Storage Tree Spots Wire for Payout

In a matter of seconds, any one of 40 reels or spools of magnet wire can be positioned for payout to a winding head in the motor repair department at Columbus Electrical Works, Columbus, Ohio. And, without altering position, storage of these 40 reels takes up less than 5 sq ft of floor space.

Through a constant search for more efficient methods of storing commonly used sizes of magnet wire for immediate de-reeling, motor shops have devised reel turntables, ferris wheels and a number of other devices. At the Columbus shop, a reel tree is the answer to this problem.



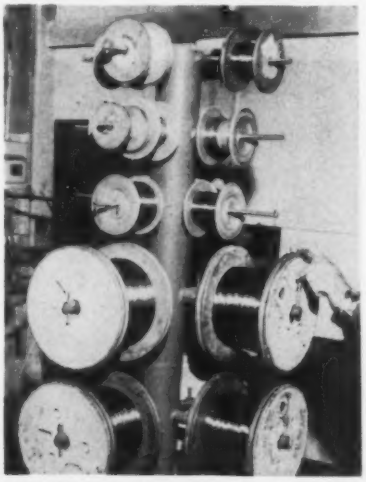
REEL TREE stores total of 40 magnet wire reels and spools; rotates to spot selected wire sizes for payout to winding head in foreground. Unit takes up less than 5 sq ft of floor space.



LOCKING DEVICE at base consists of notched plate on rotating upright which engages spring-actuated latch-pin (arrow) bolted to stationary base. Note reel-retention pins on arms. Outer ones are removable for easy reel replacement.

Basic design of the free-standing "tree" embodies a 6-ft high "trunk" of 4½-in. steel pipe (¼ in. wall) which rotates on a 24½-in. diameter base of ½ in. steel plate. The trunk supports seven tiers of "branches" —each tier consisting of four diametrically opposite horizontal rod arms to support the reels. Each of the 16 lower arms is a 13½-in. length of 1-in. diameter steel stock threaded to fit couplings welded to the upright pipe. Horizontally, these arms are 90 degrees apart; vertically, they are 13 ins. center-to-center to support 12-in. diameter reels. Each arm has two reel-retention pins 9 ins. apart. The inner stationary one is about 4 ins. from the standard; the outer one is removable for easy replacement of reels.

The upper 12 "branches" follow a similar pattern. Here, each arm is a 10-in. length of ½-in. round steel stock threaded to fit the "trunk" couplings. Vertical spacing be-



TOP OF TREE close-up showing arrangement of arms for 12-in. wire reels and 6-in. spools. Top arms hold single or double spools of magnet wire.

tween arms is 7½ ins. so each can hold two 6-in. diameter magnet wire spools. Cotter pins hold the spools on the arms.

A ball bearing arrangement permits the pipe upright to rotate easily on the base plate, even when the tree is loaded with a full complement of reels. The arms are manually turned until the ones with selected wire reels are parallel to the spindle of the winding head, then locked in payout position by a latching device at the base plate.

Welded near the base of the rotating upright pipe is a 12-in.diameter, ¼ in. steel locking plate with four rectangular, peripheral notches at diametrically opposite positions. The notches seat the square head of a spring-actuated pin operating in a 3-in. channel bracket bolted to the stationary base. Head and round shaft of the 5-in. long pin were machined from a piece of ¾-in. square steel bar stock.

To position a group of reels for payout, the latch pin is retracted to ride the rim of the locking plate until the selected notch is reached. The spring-actuated latch snaps into the notch and holds the arms stationary while the wire is being de-reeled onto the winding head.

Shop mechanics find the reel tree an exceptionally convenient and time saving addition to the coil winding department; feel that it is particularly advantageous in areas with limited floor space for de-reeling setups and reel storage.

LATHE SPROCKETS are stored conveniently in a compact filing cabinet containing a series of wood-block shelves which have been drilled halfway through to receive various sprocket wheels. Since diameters of these recesses coincide with diameters of the various sprockets, and since front edges of the sliding shelves are marked to identify these wheels, accuracy of storage is doubly insured. The cabinet is installed in the shop of the Electric Equipment Co., Bridgeport, Conn.

Plant Maintenance and Engineering Conference Reveals Swing to Outside Contractor Help

Maintenance and repair of industrial plant and equipment is a big business and it is growing bigger. That was evident at the 10th Annual National Plant Maintenance and Engineering Conference and Show held at Cleveland, Ohio, January 26-29. Thirty-one concurrent sessions with 62 speakers explored almost every facet of maintenance operation. Exhibits at the show, valued at more than $7½ million and representing more than 10,000 products of 375 companies, highlighted equipment and materials to facilitate maintenance. An estimated 20,000 executives, engineers and maintenance personnel visited the four-day affair.

An indication of the importance of maintenance to industry was given at the opening session. L. C. Morrow, New York, general chairman of the conference and consulting editor of *Factory* magazine, presented some interesting figures from a *Factory* study of 687 manufacturing companies listed on the New York and American stock exchanges. These companies, representing a gross property of $115,168,474,000 and net sales of $182,247,734,000, reported $7,518,228,000 spent for maintenance and repair —or an average of 4.125% of net sales, or 6.527% of gross property cost. Highest maximum ratio of maintenance and repair cost to net sales is 17.46% for heavy fabricating industries.

PONDERING ANSWERS to questions on electric power economics are W. C. Wallin (seated), plant engineering dept. chief at Western Electric Company's Winston-Salem, N. C. plant and P. A. Dethloff, building supt., Continental Can's research and development department, Chicago. Duo headed subject-session at recent National Plant Maintenance and Engineering Conference in Cleveland. Mr. Wallin is the new president of the American Institue of Plant Engineers.

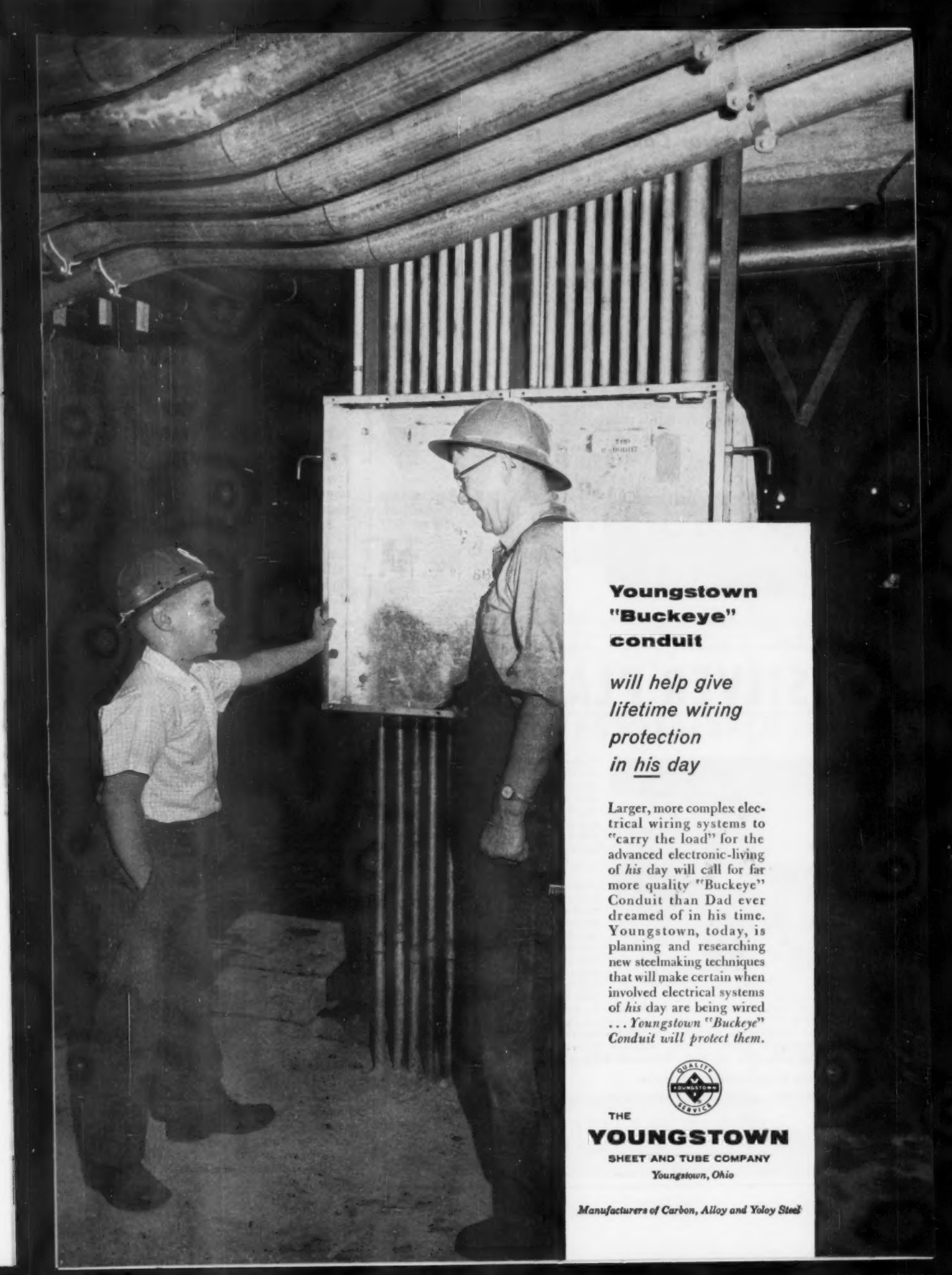
O. W. Gravely, director of maintenance, Electro Metallurgical Co., division of Union Carbide Corp., Niagara Falls, N. Y., told the conference that "during the past ten years, automation, mechanization, and increased labor and material costs have increased as a part of product cost to the point where the necessity for controlling maintenance is vital to a manufacturer continuing in business." Mr. Gravely estimated total cost of maintenance to U.S. industry at about $16 billion with a 25% waste due to lack of understanding of the maintenance function or improper methods employed at factories.

Case studies of how maintenance is planned, managed, scheduled, supervised, controlled and operated in a vast cross-section of industry was the general subject of the 31 technical sessions. Speakers represented plants ranging from five to upwards of 1,000 maintenance workers. Interesting maintenance to production worker ratios were revealed. One automotive structural member plant with 250 production employees has 5 to 6 maintenance workers. A chemical plant with 725 "operators" to produce some 61 products has a maintenance department with 986 hourly and 131 salaried employees including supervisory, technical and clerical personnel. Another plant in the synthetic rubber field reported one maintenance-plant engineering employee for every 1¾ production employees or for every 3¾ total plant employees. Preventive maintenance is a basic requirement of plant operation. A realistic goal of 85% preventive maintenance and 15% breakdown maintenance can be achieved with intense effort and a systematic approach, according to J. M. Conrow, works engineer, Longhorn Division, Thiokol Chemical Corp., Marshall, Texas. Speaking on the subject of medium sized plants (up to 300 maintenance employees), Conrow reiterated the need for paper work for effective control; adequate planning and scheduling; and development of a fair and adequate method to measure work output of maintenance crafts.

SESSION LEADERS on contract maintenance at recent National Plant Maintenance and Engineering Conference in Cleveland were (L to R): chairman Marshall Dyer, Trundle Consultants, Inc., Cleveland; and speakers N. M. Brown, plant engineer, Pennsalt Chemicals Corp., Wyandotte, Mich.; and P. M. Kimmell, plant engineering supervisor, Eastman Kodak Co. Hawk-Eye Works, Rochester, N. Y.

With its increasingly vital role in efficient plant operation should maintenance be done by plant departments or by outside contractors? The "what", "when" and "how" of this important question were analyzed in a separate session chairmanned by Marshall Dyer, Trundle Consultants, Inc., Cleveland, with plant engineers Norton M. Brown, Pennsalt Chemicals Corp., Wyandotte, Mich., and Phillip M. Kimmell, Hawk-Eye Works, Eastman Kodak Co., Rochester, N. Y., providing the answers.

A definite swing to outside contractors for all or part of plant maintenance was reported. Over the past decade refineries and chemical plants have contracted for a larger portion of their maintenance, several for about 50%. In the past two years several large refineries and chemical plants, mostly new plants, have contracted 100% of their maintenance. This general trend was indicated by Mr. Kimmel's report of a 1958 *Factory* magazine survey. Of 359 respondents (with total of 750,000 employees), "farmed-out" maintenance varied from 15% to 85% for



Youngstown "Buckeye" conduit

will help give lifetime wiring protection in his day

Larger, more complex electrical wiring systems to "carry the load" for the advanced electronic-living of *his* day will call for far more quality "Buckeye" Conduit than Dad ever dreamed of in his time. Youngstown, today, is planning and researching new steelmaking techniques that will make certain when involved electrical systems of *his* day are being wired ... *Youngstown "Buckeye" Conduit will protect them.*

THE
YOUNGSTOWN
SHEET AND TUBE COMPANY
Youngstown, Ohio

Manufacturers of Carbon, Alloy and Yoloy Steel

SHOP TALK huddle after a session at the National Plant Maintenance and Engineering Conference in Cleveland is enjoyed by (L to R) W. F. Bower, general plant engineer, SKF Industries, Inc., Philadelphia; and plant engineer F. C. Buckley of the company's Frankfort plant.

small plants to a range of from 12% to 35% for large plants. In the large plant category, 40% contracted some or all of their maintenance; 50% of those in the small plant category did this.

Three criteria were mentioned as the basis for going to contract maintenance: (1) lack of proper skills or tools, particularly in the small plant; (2) wide variations in the man-hour work load; and (3) lower cost. Four types of contract-maintenance services were noted: (1) labor only; (2) a specific, defined job under a bid or cost-plus contract; (3) a permanent supplemental force; and (4) maintenance management wherein the contractor plans, coordinates and supervises the work, furnishes all labor and material and coordinates his work with a plant staff.

Although no general formula for contract-maintenance was developed, this rule-of-thumb approach to the problem was presented. Contract maintenance is indicated if a plant has less than 40 or 50 main-

SWAPPING IDEAS at one of the recent Plant Maintenance and Engineering Conference sessions at Cleveland are: G. L. Shaffer, IBM project engineer, Kingston, N. Y.; and H. Goodyear, plant engineer, Empire Brushes, Inc., Port Chester, N. Y.

ANALYZING winding exhibits at the National Industrial Service Association booth at the recent Plant Maintenance & Engineering Show in Cleveland are NISA national vice-president H. C. Blenkhorn, Blenkhorn & Sawle, Ltd., St. Catharines, Ont., Can.; and staff engineer Arthur C. Roe.

tenance craftsmen, is lacking in specific skills and tools, has a wide work-load variance, can get outside maintenance at lower cost. On the other hand, "do-it-yourself" maintenance is indicated if a plant has 40 or 50 or more craftsmen with all the necessary skills and tools; has a competent plant engineering staff; has a realistic work measurement system; has an apprentice education program; has a planned, stable work load.

While conference sessions did not pin-point general electrical maintenance as such, it was included as part of the over-all maintenance operation in a number of papers. Generally, plants do this them-

OBSERVING winding demonstration at the NISA Plant Maintenance & Engineering Show at Cleveland recently are Ed Margolis (left), Motor Repair & Manufacturing Co., Cleveland, exhibit chairman; Don Fowler, Reserve Electric Co., Cleveland, chapter secretary; and George McKeowan, MQN Electric Co., Mentor, Ohio, president.

NISA SERVICES attract attention at Plant Maintenance Show in Cleveland. Watching Ed Jent, Reserve Electric Co., Cleveland, wind stator are: (L to R) W. R. Kane, Kane Electric Co., East Cleveland; Charles Kuehn, Redmond and Waltz Electric Co., Cleveland; and George Blackburn, electrical foreman, Titanium Metals Corp., Toronto, Ohio.

selves. In addition to specific building maintenance categories, the following were mentioned as established or possible contract-maintenance areas: control instruments, refrigeration equipment, machine rebuilding, high voltage work, parts or all of small or medium construction jobs which would constitute a peak work load.

One important employee-relations point was emphasized. When contract maintenance is considered, be certain that employee security is assured—no one is to be displaced by contractor personnel. This indicates a substantial area of contractor services for "peak-load" work and the prime reason for 100% maintenance contracts being in new plants which had not built up a maintenance department.

Out of the 31 sessions came these important observations. Maintenance has long passed the "fix-it" stage; it is a highly organized operation gaining increased recognition by management as an integral function of efficient plant operation and an important factor in product cost.

Organization and operation of a maintenance department must be geared to a plant's operation; should have appropriate skills and tools for efficient operation; should include a planned, controlled, preventive maintenance program and appropriate scheduling to maintain a steady work load; should be managed to carry its full responsibility in cost reduction, increased plant reliability, and plant productivity at an economical level.

A substantial area for contract

maintenance does exist and an increasingly larger number of plants are investigating and using contractor services. Contractors in or entering the electrical maintenance field must acknowledge that a maintenance program is geared to a specific plant operation; must analyze the services and advantages they have to sell; must present plant management with a sound economic reason for buying their service.

Aluminum Conduit Prices Lowered

Pricewise, aluminum rigid electrical conduit is becoming more competitive with steel conduit. Kaiser Aluminum and Chemical Sales, Inc., Chicago, announced February 11 a published price schedule showing cuts of from 10 to 14% depending upon conduit size and shipping zone. The report asserts the new per-foot delivered price of their product now averages only 2 to 3% above steel conduit and in several areas the prices are equal.

Taking into consideration lighter weight, "this new pricing schedule makes aluminum conduit more economical than steel in virtually all types of electrical installations," stated J. T. Dugall, general manager of the company's electrical conductor division.

AT NISA Chapter Officers Conference in St. Louis were V. A. Bradley, president of Southwestern Chapter, Bradley's Electric, Corpus Christi, Texas; and Richard Harris, vice president of Mid Atlantic Chapter, Harco Equipment Co., Washington, D. C.

CHARLES GIBSON, Chief of the Bureau of School Planning for California, and C. L. Crouch, Secretary of the Illuminating Engineering Research Institute, were on hand at the Los Angeles January conference when Prof. Finch of the U of C presented the results of his 5-year study of reflected glare. Both Gibson and Crouch related the technical research to practical applications, stressing the fact that more than half of the effectiveness of school and office lighting may be lost due to improper placement of fixtures.

Wallin Heads Plant Engineering Group

William C. Wallin, chief of the plant engineering department, Western Electric Company's Winston-Salem, N. C., facility was elected national president of the American Institute of Plant Engineers at the Institute's Board of Directors meeting in Cleveland. The Board meets annually while the Plant Maintenance and Engineering Conference is in session.

Other newly-elected national officers are: vice president—James Weeks, Proto Tool Company, Los Angeles, Calif.; secretary—F. G. Fryberger, Food Machinery and Chemical Co., Baltimore, Md.; treasurer—Leo Monty, Artisan Metal Products Co., Waltham, Mass.

Illinois Inspectors Review Code Proposals

A resume of proposals for change in the 1959 National Electrical Code, and discussion of code interpretations and inspectors' problems were highlights of the 29th annual meeting of the Illinois Chapter, IAEI. Held January 29 and 30 at the Hotel Sherman in Chicago, the two-day conference attracted over a total of 150 inspectors, contractors, and representatives of various segments of the electrical industry.

NEW CHAIRMAN Donald E. Coutts, Chicago Inspector, addressed members during closing session of Illinois Chapter, IAEI, meeting held in Chicago January 29-30.

H. H. Watson, commercial engineer, Sales Department, Construction Materials Division, General Electric Co. in reviewing the proposed changes spelled out what seemed to be the most important revisions. Mr. Watson pointed out that although the various code making panels have approximately completed their work, the exact wording of the new amendments will not be made known until May. Briefly, here are some of the changes discussed by Watson:

(1) *Grounding type outlets in dwellings:* Because of the increased use of electrically operated equipment, only grounding type outlets will be permitted in laundry rooms, open porches, breezeways, basements, cellars, work shops, garages, on exterior surfaces of outside walls or in like locations where the outlet may supply equipment used by per-

CONTINGENT of inspectors and contractors from the Quad City area attending recent meeting of Illinois Chapter, IAEI, in Chicago were: (L to R) Phil Krouth, White Electric Co, Moline, Ill.; Gerald Farlow, Farlow Electric Co., East Moline, Ill.; Harry Frieden, Inspector, Moline, Ill., and Jack Mahar, Inspector, Rock Island, Ill.

ELECTRICAL INSPECTOR Owen E. Dillon and electrical contractor Al Seelig, both of San Diego, found time during a recent trade show to discuss questions on the code. The show formed a fitting backdrop for the annual dinner meeting of the Bureau of Home Appliances Contractors Division.

sons standing on the ground or on grounded conductive materials.

(2) *20-amp appliance circuits:* In order to provide for the increased use of portable appliances, two 20-amp receptacle branch circuits will be required in kitchen, laundry, pantry, dining and breakfast areas of dwellings.

(3) *Location of convenience outlets in dwellings:* Because of the increased number of L-shaped combination living-dining rooms and resulting confusion in application of 20-ft rule to the imaginary boundary line between the two rooms, an amendment has been drawn up that shall require convenience outlets to be installed so that no point along the floor line in any usable wall space is more than 6 ft, measured horizontally, from an outlet in that space. (A usable wall space is defined as any usable space 2 ft wide or greater including the wall space occupied by sliding panels in exterior walls.)

EAST MOLINE, ILL., CONTRACTOR Gerald O. Farlow, Farlow Electric Co. was one of many contractors who attended recent meeting of Illinois Inspectors in Chicago.

ENTERPRISING MEMBER of the Kalamazoo, Mich., electrical contracting fraternity is W. D. Beall, president of Beall, Gibson & Roush Electric, Inc. Mr. Beall specializes in industrial work; believes participation in the competitive field keeps a firm on its technical and business toes.

(4) *Optional load calculation for one-family residences:* One-family dwellings served by 100-amp services will be permitted to use a somewhat more liberal diversity factor than now permitted. (see table below)

Load (In Kw or Kva)	% of load
Air conditioning and cooling including heat pump compressors	100%
Central electrical space heating	100%
Less than four separately controlled electrical space heating units	100%
First 10 kw of all other load	100%
Remainder of other load	40%

(5) *100-amp service:* Single family residences with an initial load of 10 kw or more computed in accordance with the code (sec. 2203) shall have a minimum service entrance of 100 amps, 3-wire. (The code will still recommend 100-amp minimum service for all residences.)

(6) *277-volt fluorescent lighting:* Present wording of the code has been clarified and 277-volt branch circuits for fluorescent lighting may be used in any occupancy except those similar to residences.

(7) *Non-interchangeable circuit breakers:* Non-interchangeability of circuit breakers in the 0-250-volt ac class for all residential occupancies and any other occupancies that do not maintain competent electrical supervision will no doubt be one of the restrictions of the new

code. Breaker classifications will be: 0-20 amps, 21-50 amps, and 51-100 amps. Breakers may be interchanged within each current classification but not between classifications.

There are of course a great number of other changes scheduled for the '59 Code, including a completely new numbering system, but the above details a few of the more important revisions.

Present day code problems discussed during the open floor panel sessions moderated by Frank Stetka, electrical field engineer, NFPA, provided those in attendance with many interesting and informative moments. Subjects debated at length were: (1) Defining fixed and portable appliances. (2) Electric heat, especially cable installations. (3) Aluminum conduit and fittings and their uses. (4) Wiring in filling stations and hazardous locations.

Officers elected at the close of the two day meeting were: Donald E. Coutts, Electrical Inspector, Chicago, chairman; Lyle E. Dunham, Springfield, Ill., first vice chairman; William P. Hogan, Chicago, second vice chairman; Leland J. Hall, Orland Park, Ill., third vice chairman; and Clarence A. Wingfield reelected secretary-treasurer. Members who will comprise the executive committee for '59 are: Edward J. Boyle, Chicago, chairman; George Albiez, Chicago, (wholesalers); William Veldhouse, Chicago, (contractors); James Smith, Chicago, (manufacturers); Cal Condon, Flossmoor, Ill., (past chairman); Harold Hady, Lake Villa, Ill., (suburban).

It was announced that the spring meeting of the Chapter will be held May 21 and 22 at the Faust Hotel in Rockford, Ill.

NISA director Ben J. Horton, of Atkinson Armature Works, Pittsburgh, Kansas, welcomes a new shop owner, Carl Evans, of Central Electric Repair Co., Hutchinson, Kansas, to a meeting of Heart of America Chapter in Salina, Kansas.

New York City Industry Advisory Board Organized

A special industry advisory board has been organized to assist the Bureau of Gas and Electricity, Department of Water Supply, Gas and Electricity of New York City. Composed of representatives from different segments of the electrical industry, the board will meet once a week to exchange ideas and offer suggestions that will help the department meet the city's constantly changing electrical problems. The board's major duties are to recommend approval of electrical apparatus and material, approve unusual installations, and consider extraordinary applications not specifically covered by the electrical code.

"The formation of this committee is one of many steps we are taking to modernize and streamline our department," said Armand D'Angelo, commissioner. "It will lighten the work load on borough inspectors with Civil Service status enabling them to concentrate more activity on fields where they are specialists."

Members of the Advisory Board are: Felice Marcellino, Bureau of Gas and Electricity, Department of Water Supply Gas and Electricity, chairman; Charles G. Keenan, Deputy Chief Engineer, Department of Water Supply, Gas and Electricity; C. E. Smith, Jaros, Baum and Bolles, Inc.; H. J. Vorzimer, Federal Pacific Electric Co.; E. L. Heine, Albin Gustafson Co.; M. E. Newman, N. Y. Board of Fire Underwriters; Helge Jensen, Empire Switchboard Co.; and Isidore Helfman, Department of Water Supply, Gas and Electricity.

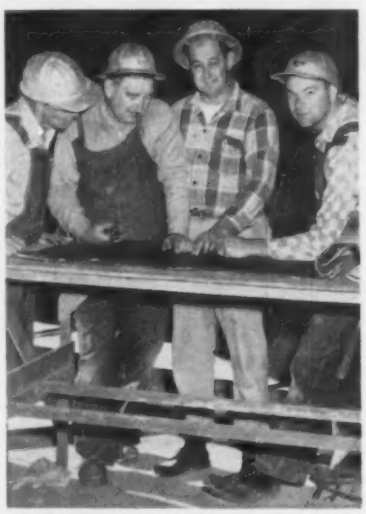
Commissioner D'Angelo also announced the appointment of three other major committees. William A. Moore of the Bureau of Gas and Electricity has been named chairman of the Code Interpretation & Revision Committee. This committee is responsible for bringing the electrical code up to date and of the rendering of interpretation of the code rules, when requested by electrical contractors, consulting engineers or other interested parties.

The other members of this committee are: Isidore Helfman and Felice Marcellino of the Department of Water Supply Gas & Electricity; J. O. Covington and William Uzzell of the Consolidated Edison

Systems; A. J. Kleinberger, consulting engineer; F. B. Graham, Syska & Hennessy, Inc.; D. B. Haring, Hatzel & Buehler; and J. R. Bernard, Real Estate Board of New York.

The License Board will pass on the licensing qualifications of electricians and motion picture operators and also conduct hearings regarding violations of the rules and regulations. B. F. Greene, Bureau of Gas & Electricity, is chairman of this committee and the other members are: H. A. Webster, T. Frederick Jackson, Inc.; J. P. Sullivan, President, Local Union No. 3, International Brotherhood of Electrical Workers; C. E. Schaad, N. Y. Board of Fire Underwriters; J. D. O'Connell, Consolidated Edison Systems; Herbert Lippman, Architect and P.E.; and E. S. Guilford, Charles F. Noyes & Co.

The Safety Committee is headed by Alexander Lurkis, Chief Engineer of the Bureau of Gas & Electricity. This committee checks on unsafe electrical conditions and the other members are: D. B. Haring, Hatzel & Buehler, Inc.; J. D. O'Connell, Consolidated Edison System; R. C. Lent, New York City Fire Department; J. P. Sullivan, Local Union No. 3, IBEW; and C. E. Schaad, New York Board of Fire Underwriters.



ON-THE-SPOT CHECK of installation details is made by Chick Terrill (second from right) who presently is supervising electrical work for contractor Charles A. Langlais on a new Crown Zellerbach office skyscraper in San Francisco. Pictured with him is job-foreman Ray Brigaerts (second from left), also journeymen Jack Scott and Bill Brunfield, seen at the L-and-R-end positions.

New Officers Elected for NYECA

At the annual meeting of the New York Electrical Contractors Association, Inc., the following officers were elected to serve for the year 1959: John Doris, president; John W. Frommer, vice president; Jacques R. Mann, treasurer; and John J. Morrissey, secretary.

John Doris was also named chairman of the Executive Committee. Other committee chairmen are M. S. Blumberg, Membership; J. W. Werther, Legislative; J. P. Morrissey, Constitution and By-Laws; J. W. Frommer, Trade Jurisdictional; and E. A. Kahn, representative on Board of Governors, National Electric Contractors Association.

NISA News

A history of the Mid-South Chapter of NISA, founded as the Tennessee Chapter in 1942, has been published as part of a chapter directory. The history was written by Ed Grant, well known fractional horsepower motor repairman, who was national president of NISA in the '40's.

• • • •

Plans for the International Convention of NISA are nearing completion according to D. D. Bishop,

ATTENDING the recent NISA Chapter Officers Conference in St. Louis were these Ohio Chapter presidents: John C. Wagner, Cincinnati Chapter, Electric Motor Service Co., Cincinnati; and Fred R. Wilkin, Central Ohio Chapter, American Electric Works, Lancaster, Ohio.

AT A RECENT MEETING of Ontario and Quebec chapters of NISA in Montreal, from left, Harry Leeming, Standard Electric Armature, Ltd., Toronto; Gil Fenton, Stratford (Ontario) Electric Co.; and Harry Drinkwater, Drinkwater Electric Co., Toronto.

general chairman, of Montreal Armature Works, Montreal, Que., site of the meeting. Mr. Bishop said that registrations may top those recorded at all previous NISA conventions, including last year's record 1,100 at New Orleans. Exhibit chairman Paul Barbeau said that all but a few exhibit spaces have been sold. Plans of the women's committee, headed by Mrs. Bishop, have been mailed to all NISA wives. Hotel reservations are going fast, according to officials at the Queen Elizabeth, the new luxury hotel where the convention is to be held May 17-20. Interest in NISA meetings seems to be at an all-time high, according to executive vice-president Joseph M. Harrington.

• • • •

The annual NISA Ideas Content, which awards cash prizes to members who submit the best managerial and technical ideas, is nearing its deadline for entries, April 7. Chairman Alex Shovan has been encouraging NISA chapters to hold their own contests, then forward the entries on to the national office. Several, including the Quaker City, New York, New England, Mid-South and North Central, have responded. In all, approximately 75 entries will probably be submitted to the judges who will meet in April in St. Louis.

New offices for the association's headquarters have been opened in the suburb of Clayton, a west-end community in the St. Louis area. The new address is 7730 Carondelet, St. Louis 5, Mo. The offices had been in the downtown area of St. Louis.

NISA president Paul Sievert addressed members of the Greater St. Louis chapter at a meeting February 3 at the Mark Twain Hotel in St. Louis.

• • • •

Southwestern Chapter's executive committee met in Fort Worth, Texas, on January 24 to complete plans for its spring meeting in Brownsville, Texas, March 19-21. Attending were J. B. Johnson, H. F. Champion, Robert Killion, James A. Phares, James M. Morgan, G. E. Jones, George T. Kinard and Miss Ann Hickman, the chapter's executive secretary.

All Electric Co., Tulsa, Okla.; McAllen Armature Works, McAllen, Texas; and Taller Electric Alvarez, Monterrey, Mexico, have joined the Southwestern Chapter, Miss Hickman announced.

• • • •

Bernard Ferrari, Excel Electric Service, Chicago, has been elected president of the Central District Chapter. Other officers are: vice-pres., Sigmund Pluskota, Pluskota Electric Co.; secretary, W. J. Billings, Ebling Electric; treasurer, H. W. Reeve, Inland Industrial Electric Service; and directors, Clarence Sievert, W. L. Kaska; Alexander J. Lewus; Walter Lucke; Jay Almerico; Elmer Jandt; Thomas Callaghen and Abe Marcus.

• • • •

Twenty-one members of Connecticut Chapter attended a meeting on January 9 at Sleeping Giant Country Club, Hartford.

• • • •

"Chain service shops will never match the personalized service of the independent owners," writes Pat Moran in the February issue of the Great Lakes Chapter newsletter.

MEMBERS of NISA's Heart of America Chapter at a recent meeting included Mark Hoffman, Hoffman Electric Co., Hutchinson, Kansas; Olin Proctor, of Electric Service Co., Kansas City, Mo.; and Bill Dyson, Hilton Electric Co., Hutchinson, Kansas.

NISA PRESIDENT Paul Sievert (left) meets with Wisconsin Chapter members at a recent meeting in Madison. With him, from left: Oscar Ganske, Electric Motor Repair Co., Madison; Jerry Miller, N. B. Berntson and Dave Thornell all of Electric Motors Unlimited, Madison.

"We must have modern tools to meet modern problems (through NISA). In the years to come, a lone wolf in the motor service business will soon become a dead wolf."

• • • •

Great Lakes Chapter is another that is writing its history. Historian Pat Moran has issued a call for photos, letters, facts . . . "any information will be appreciated," he says.

• • • •

King Coal Chapter members were guests of O. D. Whitfield at a meeting in Madisonville, Ky., on January 15. NISA engineer Art Roe addressed the group on the advantages of glass banding tape.

• • • •

Variable speed drives were discussed at a meeting of the Los Angeles Chapter on Jan. 13.

• • • •

The annual Foremen's Meeting of New England Chapter will be held on March 14. Robert Sandman, chapter vice-president, of Sandman Electric Co., 660 Parker St., Boston 20, Mass. is in charge of arrangements.

• • • •

Best attendance of any NISA chapter is being recorded by the New York Chapter. NISA Director Alex Shovan, Industrial Electric Service, Hawthorne, N. J. reports that an average of about 70 persons has attended each of the three meetings at the Hotel Shelburne.

On February 5 the chapter held its annual "Ladies' Night". Nine past-presidents were presented with plaques by a national past-president, Alfred Elson Jr., of New England Machine & Electric Co., Pawtucket, R. I.

North Central Chapter will meet in St. Paul, Minn., on April 3-4 at Hotel Lowry. The fall meeting will be held September 11-12, location to be selected.

• • • •

A series of lectures by a professor from the University of Washington is being given to members of Puget Sound Chapter.

Electrical Contractors To Sponsor Contest

The Association of Electrical Contractors, Inc. with the cooperation of the New York City Board of Education will sponsor, late in May, the fourth annual "Electrical Trade Proficiency Contest" for the senior electrical students in the City's vocational high school system.

The mechanics of the contest is supervised and conducted by the Board of Education Vocational High School Bureau. The head of the Electrical Department in each school selects two of his top senior students to compete in the contest. They are assembled at one of the school shop classes and given a written and practical examination.

Contributing sponsors donate the prizes, consisting of savings bonds, equipment and employment opportunities.

The Association of Electrical Contractors has offices at 409 Grand St., Brooklyn, N. Y.

Bright Outlook For Construction In Alaska

In construction activity, Alaska now ranks with some of the largest and most prosperous of our states and the chances are good that this relative position will be retained or improved in the future. This optimistic outlook was made recently by Ewan Claque, Commissioner of Labor Statistics, U. S. Dept. of Labor, in an address before the 20th Annual Building Products Executives Conference in Washington, D. C.

As it enters the Union as our 49th state this year, Alaska will be the smallest population-wise, with about 210,000 persons, and the largest area-wise, with 365 million acres.

Alaska is already the site of numerous important Federal defense facilities, because of its strategic military location. Federal construction constitutes its principal business activity, and the construction industry in recent years, supported mainly by Federal funds, has accounted for nearly a third of all employment.

Statistics are not available covering private construction in Alaska during recent years. But building-permit data is reported by Anchorage, largest city in Alaska, to the Bureau of Labor Statistics. These data give evidence of substantial expansion in private construction to keep pace with recent population increases, and the diversification of needs which this represents. Last year's gains over 1957 in private construction in Anchorage were primarily in relatively small industrial buildings, although a substantial amount of commercial building has been taking place in the past several years.

Public expenditures for construction by the Alaskan government have been minor, Mr. Clague reported. However, Alaska lacks an extensive highway and railway network over its vast and rugged terrain. It has spent more than most states on airports, and on water transport and terminal facilities.

A substantial amount of civil public works in Alaska is financed directly by the Federal Government. Some of this work is under provisions of a law passed in 1949 to help foster economic and social development in Alaska by providing community facilities. Under this program a total of 18 projects were under way in 1958, to cost $8.4 million. Another $5.3 million were alloted for fiscal 1959 to start construction of 12 additional projects in 1958 and 1959. And applications are now pending for about $30 million for such facilities as schools, utilities, public buildings, and streets.

The need for extending Alaska's highway system is acute. Apportionments during fiscal 1959 for highway work to be done in 1958 and later years, under the Federal Highway Act of 1956, totaled nearly $22.8 million, compared with about $15.8 million in fiscal 1958. Also provided by Congress in 1958 were $16.8 million for rivers and harbors, including a large flood protection program for the Chena River at Fairbanks, and harbor improvements at Anchorage. And about $5 million of Federal aid was authorized for Alaskan schools in areas where enrollment was affected by activities of the Federal Government.

THREE CHICAGO MEMBERS, Jack Horner, Commonwealth Edison Co. (right); Edward Boyle, Chicago Inspector, (middle); and E. Cogan, International Secretary, (left) were part of an All-Industry Panel that discussed current code problems at one of the sessions of the Illinois Chapter, IAEI, meeting in Chicago.

Other Federal appropriations include $6.5 million for construction of hospital facilities in Anchorage, Fairbanks and Juneau, and $2.5 million for rehabilitation of the Nome airport, and for work at large and small airport facilities throughout the area.

The largest single construction market in the foreseeable future in Alaska, however, will continue to stem from new military facilities and expansion of existing installations, according to Mr. Claque. Only three or four States exceed Alaska in the amount of Federal military construction. Almost $100 million of military projects were underway in Alaska in 1957. A year later the total had swelled to over $200 million. Contracts awarded during the first half of 1958 alone totaled nearly $62 million, including approximately $12 million of work for Air Force operational facilities, $12 million for family housing, $6 million for a nuclear heat and power project, and nearly $4 million for communication and warning systems. The cost of ballistic missile early warning sites under construction in Alaska will shortly total well over $250 million when a new base south of Fairbanks is started.

These activities add up to a large volume of construction both under way and anticipated. They are part of the growing Alaska, and reflect relatively rapid, yet undramatic development.

Alaska's future potential growth, however, is very dramatic. Its resources are fabulous, and its economic development could be explosive. The possibilities for construction there in the near and later future are enormous. Briefly, they revolve around the natural resources—oil, gas, minerals, and timber—and relate to Alaska's location as a link between the Occident and the Orient.

DATES AHEAD

Industrial Electrical Exposition—Sponsored by Essex Electrical League, National Guard Armory, Elizabeth, N. J., March 10-12.

International Association of Electrical Inspectors—Virgina Chapter, Charter House Hotel, Fairfax, Va., March 30-31; **Ellis Cannaday Chapter of North Carolina,** Carolina Hotel, Raleigh, N. C., April 7-8; **Georgia-South Carolina Chapters,** Joint meeting, Richmond Hotel, Augusta, Ga., April 12-14; **Alabama Chapter,** Jefferson Davis Hotel, Montgomery, Ala., April 16-17; **Florida Chapter** Sarasota Terrace Hotel, Sarasota, Fla., May 8-9; **Baton Rouge, George Welman, North Louisiana-East Texas, Texas, Texas Gulf Coast Chapters,** Five chapter joint meeting, Carlton Hotel, Tyler, Texas, May 15-16; **Northwestern section** Seattle Hotel, Seattle, Wash., August 24-26; **Canadian Section,** Montreal, Quebec, Canada, September 25-26; **Western Section,** Schroeder Hotel, Milwaukee, Wis., October 5-7; **Southern Section,** Heidelberg Hotel, Jackson, Miss., October 12-14; **Mississippi Chapter,** Heidelberg Hotel, Jackson, Miss., October 12-14.

Illuminating Engineering Society—Regional Conferences; **East Central,** Lord Baltimore Hotel, Baltimore, Md., April 8-9; **Southeastern and South Central,** Grove Park Inn, Asheville, N. C., April 23-24; **Southwestern** Shamrock-Hilton Hotel, Houston, Texas, May 4-5; **Midwestern,** Pere Marquette Hotel, Peoria, Ill., May 6-8; **Inter-Mountain,** Continental Hotel, Denver, Colo., May 11-12; **Pacific Northwest,** Buffalo Springs Hotel, Bariff, Alta., (Canada), May 26-30; **Northeastern,** Curtis Hotel, Lenox, Mass., June 4-5; **Canadian,** Chateari Laurier, Ottawa, Ont., (Canada), June 11-12; **Great Lakes,** Statler Hotel, Buffalo, N. Y., June 22-23.

TONGS cut from flat ¼-in. steel and held together by a pivot bolt facilitate lifting various types of loads at Industrial Electric Company, York, Pa. Downward pull of load plus upward pull of supporting chain exerts inward pressure on tong claws, insuring firm grip on weight being raised.

American Power Conference—Sponsored by Illinois Institute of Technology in cooperation with some 14 colleges and technical societies. Hotel Sherman, Chicago, March 31 and April 1-2.

Edison Electric Institute—Annual Convention, New Orleans, La., April 5-9.

Progress in Electrical Equipment—Kiel Auditorium, St. Louis, Mo., April 7-9.

National Association of Lighting Maintenance Contractors—Annual conference, Cosmopolitan Hotel, Denver, Colo., April 27-29.

National Industrial Service Assn.—Queen Elizabeth Hotel, Montreal, Canada, May 17-21.

Building Research Institute—Building Illumination Conference, Statler-Hilton Hotel, Cleveland, Ohio, May 20-21.

Pacific Coast Electrical Association, Inc.—Annual convention, Fairmont Hotel, San Francisco, Calif., May 20-22.

National Association of Electrical Distributors—51st annual convention, Conrad Hilton Hotel, Chicago, Ill., May 24-29.

National Fire Protection Assn.—Annual meeting, Atlantic City, N. J., May 25-29.

New York State Association of Electrical Contractors and Dealers—60th Annual convention, Whiteface Inn, Lake Placid, N. Y., July 7-10.

Western Electronic Show & Convention—Cow Palace, San Francisco, Calif., August 18-21.

Illuminating Engineering Society—National Technical Conference, Fairmont Hotel and Mark Hopkins, San Francisco, Calif., September 7-11.

Canadian Electrical Manufacturers Assn.—15th annual meeting, Sheraton-Brock Hotel, Niagara Falls, Ont., Canada, September 30, October 2.

11th Biennial Electrical Industrial Exposition—Sponsored by Essex Electrical League; Armory, Elizabeth, N. J., October 10-12.

National Electronics Conference—Sherman Hotel, Chicago, Ill., October 12-14.

Electrical Progress Show—Sponsored by Electrical Association of Philadelphia, Convention Hall, Philadelphia, Pa., October 13-15.

National Electrical Contractors Association—Annual convention and 5th National Electrical Exposition, Fontainebleau, Eden Rock, Deauville and Carillon Hotels, Miami Beach, Fla., November 9-12.

National Electrical Manufacturers Assn.—Annual meeting, Traymore Hotel, Atlantic City, N. J., November 9-13.

Industrial Electric Exposition—Sponsored by Electrical League of Western Pennsylvania, Penn-Sheraton Hotel, Pittsburgh, Pa., November 17-19.

Among the Manufacturers

Headquarters Announcements

National Electric Products Corp., Ambridge, Pa. has been acquired by **H. K. Porter, Inc.**, and will continue to operate as the **National Electric Division.**

Emerson Electric Mfg. Co., St. Louis, has acquired the **Imperial Lighting Products Co.** of Latrobe, Pa., which will be known as **Emerson-Imperial Lighting Co.**

Carlon Products Corp., Aurora, Ohio, has purchased the **United Pipe and Tube Co.**, Lubbock, Tex.

Fisher Berkeley Corp., Emeryville, Calif., has purchased **Bennett Laboratories, Inc.**, Redwood City, Calif.

Jeta Metal Fabricators, Inc., has changed its name to **Jeta, Inc.**

Federal Pacific Electric Co., Newark, N. J., has acquired the **Economy Fuse and Mfg. Co.**, Chicago, which will become the **Economy Fuse Div.**

Four Wheel Drive Auto Co., Clintonville, Wis., has changed its name to **FWD Corp.**

Termite Drills, Inc., Pasadena, Calif., has changed its name to the **Relton Corp.**

International Resistance Co., Philadelphia, Pa.—Major General George I. Back (USA, Ret.), director.

Rockbestos Products Corp., New Haven, Conn.—Alfred H. Macgillivray, production manager.

Westinghouse Electric Corp., Pittsburgh, Pa.—V. B. Baker, manager of new power control and communications department; G. H. Phelps, assistant manager.

John C. Virden Co., Cleveland, Ohio—Alan R. Cripe, director of product planning.

Phelps Dodge Copper Products Corp., New York — Edward H. Michaelsen, vice president.

Gould-National Batteries, Trenton, N. J.—Harvey N. Stover, assistant vice president for industrial sales.

Pennsylvania Transformer Div., McGraw-Edison Co., Canonsburg, Pa.—T. S. Banghart, manager of switchgear sales; James S. Holtzinger, manager of application engineering; Howard D. Tindall, manager of small power transformer sales.

Cornell-Dubilier Electric Corp., South Plainfield, N. J.—Raymond T. Leary, vice president.

Delta-Star Electric Div., H. K. Porter Co., Inc., Chicago, Ill.—

Stanley C. Killian, vice president and general manager; J. F. Zboyovsky, sales manager, Thomas Works, Lisbon, Ohio.

Precision Transformer Corp., Chicago, Ill. — Melvin S. Adler, president.

Robertshaw-Fulton Controls Co., Richmond, Va.—George H. Crock, works manager, new Indiana Div. in Indiana, Pa.

Moloney Electric Co., St. Louis, Mo.—J. M. Dohr, vice president in charge of production; G. T. Wootten, plant manager.

Yardney Electric Corp., New York—Paul L. Howard, assistant vice president.

Anderson Electric Corp., Birmingham, Ala.—John H. Schuler, vice president and general manager; W. N. Davidson, division product manager, new Special Products Div.

Benjamin Electric Mfg. Co., Des Plaines, Ill. — Frederick Keller, president; John G. Beam, executive vice president; George A. Hamm, vice president; Arthur E. Swedenborg, vice president in charge of sales; Ray H. Mathison, secretary; Robert K. DiVall, treasurer.

Hanovia Lamp Div., Engelhard Industries, Inc., Newark, N. J.—Charles M. toeLaer, general sales manager.

U. S. Expansion Bolt Co., York, Pa.—Charles H. Schminke, marketing manager.

Touch-Plate Mfg. Corp., Paramount, Calif. — John Mutschler, factory superintendent.

Thomas & Betts Co., Elizabeth, N. J.—Edward F. Finn, sales promotion manager.

Revere Electric Mfg. Co., Niles, Ill.—John A. McDougall, vice president in charge of sales; C. M. Schultz, secretary and assistant treasurer.

Westinghouse Electric Corp., Pittsburgh, Pa.—William H. Loeber, marketing manager, new electric home department.

H. B. Sherman Mfg. Co., Battle Creek, Mich.—Bruce R. Simmons, sales manager.

Marcus Transformer Co., Rahway, N. J.—Nicholas A. Cruger, executive vice president and director.

International Resistance Co., Philadelphia, Pa. — A. H. Hardwick, special assistant to the president.

Electric Controller & Mfg. Div., Square D Co., Cleveland, Ohio—Edmund V. Dowden, works manager.

General Electric Co., Schenec-

tady, N. Y.—William L. Moorhead, manager, residential control sales, Appliance Control Dept., Morrison, Ill.

G&W Electric Specialty Co., Blue Island, Ill.—R. G. Poetsch, acting sales manager.

Jefferson Electric Co., Bellwood, Ill.—Bertrand J. Farrell, general sales manager.

Thomas Industries Inc., Chicago, Ill.—Robert C. Gand, district manager of lighting division.

BullDog Electric Products Div., I-T-E Circuit Breaker Co., Philadelphia, Pa.—Henry C. Egerton, general manager.

Pyle-National Co., Chicago, Ill.—Elliot M. Nesvig, vice president, marketing.

Regional Appointments

NEW ENGLAND

Paragon Electric Co.: Henry Sobell, New England district marketing manager.

McPhilben Lighting Inc.: Edward L. Gluck, northeastern regional sales manager.

Allis-Chalmers Mfg. Co.: W. T. Farnsworth, manager, Hartford (Conn.) district.

Columbia Cable & Electric Corp.: B. N. Yanow & Co., Inc., New England representative.

Georator Corp.: E. A. Janse Associates, representative for Electric Products Div. covering New England area.

MIDDLE ATLANTIC

Allis-Chalmers Mfg. Co.: R. H. Porterfield, manager, industrial sales, New York district.

S&C Electric Co.: George G. Leu, manager, new Eastern Sales Div., office in Newark, N. J.

Delta-Star Electric Div., H. K. Porter Co., Inc.: W. E. Erbe, district manager, Pittsburgh office.

Markel Electric Products, Inc., and LaSalle Products, Inc.: Richard Weinberg, sales representative in Metropolitan New York, New York east of Utica, and northern New Jersey.

Thomas & Betts Co.: Dave Parkinson, manager, Syracuse district.

General Electric Co.: Royal V. Mackey, Jr., representative for upstate New York, Silicone Products Dept.; Leonard J. Sacks, sales representative for eastern district, Silicone Products Dept.

SOUTH ATLANTIC

Crescent Insulated Wire & Cable Co., Inc.: Berry-Elsberry Co., Atlanta, Ga., representative in Geor-

gia, Alabama, eastern Tennessee and western Florida.

Crouse-Hinds Co.: William R. Major, Jr., divisional manager, Southeast Div.

Rawlplug Co., Inc.: Paul A. Eggli Jr., manager, Rawlplug Atlanta Co.

Quadrangle Mfg. Co.: Robert W. Fishburne, representative for the state of Virginia.

J. A. Weaver Co.: D. D. Camp Co., Atlanta, Ga., representative in Florida, Georgia, Alabama and East Tennessee.

EAST CENTRAL

Columbia Cable & Electric Corp.: Clyde Warble & Associates, Indianapolis, Ind., representative in southern Texas.

Allis-Chalmers Mfg. Co.: New group managers, Chicago district: Frank M. Scott, utility sales; Joseph N. Banky, heavy industrial sales; Henry W. Schaub, processing industry sales; Stanley E. Bovim, general industrial sales.

Wolverine Tube, Div. of Calumet & Hecla, Inc.: Charles M. Rhodes, sales representative in Birmingham, Ala., district.

Phelps Dodge Copper Products Corp.: A. L. Soule III, manager of distributor sales, Chicago district.

Delta-Star Electric Div., H. K. Porter Co., Inc.: Glenn R. Smith, district manager, new Detroit office; Roy E. Daub, district manager, new Indianapolis office.

D. W. Onan & Sons, Inc.: Edwin C. Swenson, eastern regional sales manager.

G&W Electric Specialty Co.: R. E. Boyle, manager, Chicago area sales.

Clark Controller Co.: Joe L. Whitely, manager, new Detroit district office.

Georator Corp., Electric Products Div.: Cozzens and Cudahy, Inc., representative in Illinois, Wisconsin and Indiana.

Electric Distribution Products, Inc.: F. R. Snider, regional sales manager for Central United States.

Curtis Lighting, Inc.: Charles T. Wallace, Chicago region sales manager.

Plymouth Rubber Co., Inc.: Turrell & Co., Inc., representative covering Michigan.

WEST CENTRAL

Columbia Cable & Electric Corp.: Arling P. Smith Co., representative for southern Texas.

Quadrangle Mfg. Co.: W. J. Childers and Robert Putterman,

DAN FINCH, professor and research engineer in the University of California's Department of Engineering at Berkeley, indicates with the use of inclined pencils that reflected glare is at a maximum when the angle of sight is directly opposed and equal to the angle of light incidence on a glossy surface. This fact, documented by a 5-year study of classroom mock-ups where thousands of tests were made, was submitted to a group of educators, utility lighting consultants and members of the trade press at a Los Angeles conference.

representatives for Texas except El Paso territory.

Thomas & Betts Co.: John Schroeder, manager of Milwaukee district.

Phelps Dodge Copper Products Corp.: K. F. Packard, district manager, new office in Denver.

Panellit, Inc.: Matney & Hanna Co., Kansas City, Mo., agent in western Missouri and most of Kansas.

Hill Transformer Co.: H. R. Harris Co., representative in Minnesota, western Wisconsin, and North and South Dakota; Charles R. McRay Co., representative in Oklahoma.

WEST

Thomas & Betts Co.: Howard C. Johnson, manager, Pacific Div.

Quadrangle Mfg. Co.: McGillan Sales Co., representative for New Mexico and west end of Texas.

D. W. Onan & Sons Inc.: Arthur R. Johnson, western regional sales manager.

International Rectifier Corp.: Neil DeFazio, sales manager, western sales region.

General Controls Co.: Robert M. Johnson, western regional manager.

J. A. Weaver Co.: Stevens Sales Co., representative in Utah, eastern Nevada, southern Idaho and western Wyoming.

SELECT THE RIGHT GENERATOR

[FROM PAGE 107]

load has a power factor of 0.80, the same as the generator rating, therefore unused capacity of the generator is 53 kva (100 – 47). Table 3 indicates 80% of unused alternator capacity or 42 kva (53 x 0.8) may be considered available to start a squirrel cage induction motor on full voltage or with a compensator starter.

Table 2 indicates that a 50% tap compensator starter with a 25-hp Design B or C squirrel cage induction motor requires available capacity of 37½ kva (1.5 x 25) to start a motor. Since this is less than available capacity of 42 kva, voltage variation of 25% or less may be anticipated with this motor-starter combination. As indicated in Table 4, load starting torque must not exceed 14% of motor locked rotor torque if this kva limit is not to be exceeded when using a 50% tap starter.

The 25-hp load may require more starting torque than the 35% (0.14 x 250) full-load torque developed by a Design C motor (rated 250% locked rotor torque) using a 50% tap compensator starter. In this case, a slip-ring motor could be substituted, using secondary control for starting duty. On a medium starting duty load this would require 50 kva (2.0 x 25) per Table 2, of an available 48 kva (53 x 0.9) per Table 3.

In the preceding example, if the 25-hp induction motor were always started before the two 10-hp motors, unused alternator capacity for this 25-hp motor would be 75 kva (100 – 25). To start the 25-hp motor with a 65% tap auto transformer will require 58 kva (2.3 x 25) compared to 60 kva (75 x 0.8) available capacity. An 80% tap compensator starter could be used on each 10-hp motor. The last 10-hp motor requires 34 kva (3.4 x 10) to start, which equals the available capacity.

The principal advantage in starting the 25-hp motor first is to increase starting torque developed by both the 25-hp and 10-hp motors and to eliminate need for a slipring motor in a medium starting torque load.

Throughout design calculations for sizing the required generator, alternative methods for starting the various loads must be carefully related to the problem.

Advertising In This Issue

• Accurate Mfg Co. 6
Adam Electric Co., Frank 143
• Advance Transformer Co. 167
Ainsworth Ltg. Inc. 18
Allen-Bradley Co. 55, 56
• All-Steel Equipment, Inc. 57
Aluminum Co. of America 76
• American Brass Co., The American Metal Hose Branch 174, 175
American Telephone & Telegraph Co. .. 12
Amprobe, a Div. of Pyramid Inst. Corp. .. 34
Amprobe Jr., a Div. of Pyramid Inst. Corp. 155
Appleton Electric Co. 2
• Arrolet Corp. 170
Arrow Hart & Hegeman Electric Co., The 156, 157
Auth Electric Co., Inc. 137

Baker-Roos, Inc. 232
• Bell Electric Co. 217
Bell Telephone System 12
Biddle Co., James G. 130
Black & Decker Mfg. Co. 203, 220
Blackhawk Industries 218
• Blackhawk Mfg. Co. 73
• Briegel Method Tool Co. 13
Brook Motor Corp. 216
BullDog Electric Products Co. 125, 127, 129, 131
Bunnell Co., G. F. 235
Burndy Corp. 59
Burnham & Co. 233
Bussmann Mfg. Co. 64, 65

Carol Cable Co., Div. of the Crescent Co., Inc. 25
Century Electric Co. 32, 33
Certified Ballast Mfgrs. 161
Champion Lamp Works 221
Chase-Shawmut Co., The 154
Cincinnati Time Recorder Co. 151
Circle Wire & Cable, a Subsidiary of Cerro de Pasco Corp. 75
Clark Controller Co., The 81
Conduit Nipple Mfg. Co. 232
Cool-Amp Co., The 212
• Cope Div., T. J., Rome Cable Corp. 231
• Crescent Insulated Wire & Cable Co., Inc. 67
• Crouse-Hinds Co. ..... Fourth Cover
• Cutler-Hammer, Inc. 164, 165, 200

Day-Brite Ltg., Inc. 42, 43
Dodge Corp., F. W. 20
• Dossert Mfg. Corp. 77
duPont de Nemours & Co., Inc., E. I. .. 68
Dutch Brand Div., Johns-Manville 23

Eagle Electric Mfg. Co., Inc. 166
• Economy Fuse & Mfg. Co. 58
Edwards Co., Inc. 172
Efficiency Electric & Mfg. Co. 232
• Electric Tube Products 69
Electrovert, Inc. 149
Esco Mfg. Co. 178
Exide Industrial Div., The Electric Storage Battery Co. 80

Federal Pacific Electric Co. 21
Feedrail Corp. 176
• Fullman Mfg. Co. 224

• Garcy Lighting Div. of Garden City Plating & Mfg. Co. 225
Gay-Lee Co. 212
Gedney Electric Co. 24
• General Electric Co.
Apparatus Sales Div. 14, 15, 16, 17, 45, 46, 47
• Lamp Div. 163
• Graybar Electric Co., Inc. 84
• Greenlee Tool Co. 190, 191
• Guth Co., Edwin F., The ..... Second Cover

Heinemann Electric Co. 223
Hein-Werner Corp. 222
• Helwig Co. 230
Henderson-Hazel Corp. 228
Hevi-Duty Electric Co. 216
• Hill Transformer Co., Inc. 219
Hoffman Eng. Corp. 147
• Holophane Co., Inc. 39
• Hose-McCann Telephone Co., Inc. 235
• Hubbell Inc., Harvey 4, 19
• Husky Products, Inc. 146

• Ideal Industries, Inc. 35, 36, 37, 38
• Ideal-Simplet Fittings Inc. 227
Ilg Electric Ventilating Co. 195
• I-T-E Circuit Breaker Co. 70, 71, 182

Jenkins Brothers 72
Jet Line Gun Co. 208
• Johns-Manville 54

Kaiser Aluminum & Chemical Sales Inc. 184, 185
Kalamazoo Tank & Silo Co. 228
• Kees Mfg. Co., F. D. 222
• Keystone Mfg. Co. 132
• Killark Electric Mfg. Co. 198, 199
Klein & Sons, Mathias 145

Lake Shore Electric Corp., The 162
Land-Air, Inc. 214
• Leviton Mfg. Co., Inc. 142
• Lidseen of North Carolina, Inc. 186
Litecontrol Corp. 66

• M & W Electric Mfg. Co., Inc., The .. 214
McGill Mfg. Co., Inc. 62
• McGraw-Hill Book Co. 234
• Midwest Electric Products, Inc. 220
Miller Co., The 51
• Minerallac Electric Co. 230
Minneapolis-Honeywell 26

National Ltg. Bureau 158, 159
National Price Service 228
National Supply Co., The 177
NuTone Inc. 9, 10

Okonite Co., The 27, 179
• Onan & Sons, Inc., D. W. 160
• O. Z. Electrical Mfg. Co., Inc. 180, 181

Pass & Seymour, Inc. 152, 153
Permacel 52
• Phelps Dodge Copper Products Corp. .. 30
Pittsburgh Standard Conduit Co. 82
• PLM Products, Inc. 197
• Plymouth Rubber Co., Inc. 169
Progress Mfg. Co., Inc. 148
Pyle-National Co., The 29

Ramset Fastening Inc. 128
Rawlplug Co., Inc., The 209
Remington Arms Co., Inc. 215
Republic Steel Corp. 60, 61
Reynolds Metals Co. 192, 193
Ridge Tool Co., The 144
RLM Standards Institute, Inc. 31
Royal Electric Corp. 124, 229

• S & C Electric Co. 187
• Simplex Wire & Cable Co. 63
Smithcraft Lighting 11
• Sola Electric Co., Div. of Basic Products Corp. 40, 41
• Sorgel Electric Co. 138
Southwestern Plastic Pipe Co. 196
Square D Co. ..... Third Cover, 1
Stampings, Inc. 230
• Steelduct Co., The 49
Steel & Tubes Division 60, 61
Stephens Mfg. Inc., M. 234
Stromberg-Carlson Co. 207
Stromberg-Time Corp. 28
Sylvania Electric Products, Inc. 74, 189

• Thomas & Betts Co., The 53
Thompson Electric Co., The 206
• Triangle Conduit & Cable Co., Inc. 50

• United States Rubber Co. 171
Universal Motor Co. 233
Up-Right Scaffolds 48
Uptegraff Mfg. Co., R. E. 78, 79
Utica Drop Forge & Tool Div., Kelsey-Hayes Co. 44
Utility Body Co. 213

Vermeer Mfg. Co. 218

• Wadsworth Electric Mfg. Co., Inc. 228
• Wagner Electric Corp. 126, 204
Wakefield Co., The 121, 122
• Westinghouse Electric Corp.
• Pittsburgh 133, 134, 135, 136
Where To Buy 235
Whitney Blake Co. 150
• Wiegand Co., Edwin L. 22
Wiley Inc., R & W. 168
Wiremold Co., The 226
• Wodack Electric Tool Corp. 235

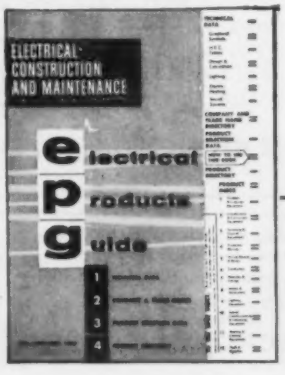
• Youngstown Sheet & Tube Co., The .. 211

• Zenith Electric Co. 234

•

CLASSIFIED ADVERTISING
F. J. Eberle, Business Mgr.

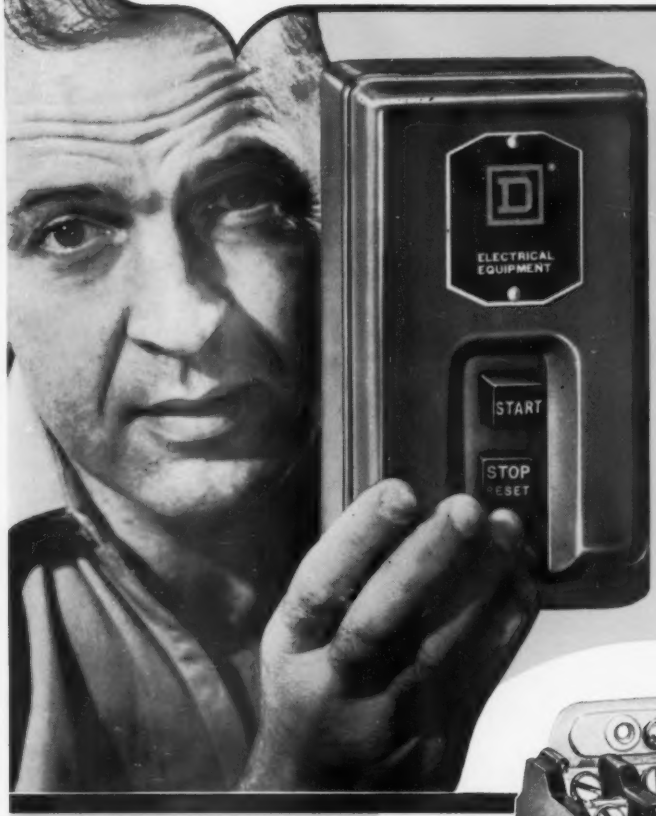
EQUIPMENT
(Used or Surplus New)
For Sale 235



• These manufacturers advertised their products in the ELECTRICAL PRODUCTS GUIDE

For more complete information, and application data on their lines, refer to the index of Advertisers in the ELECTRICAL PRODUCTS GUIDE . . . the 13th issue of ELECTRICAL CONSTRUCTION AND MAINTENANCE.

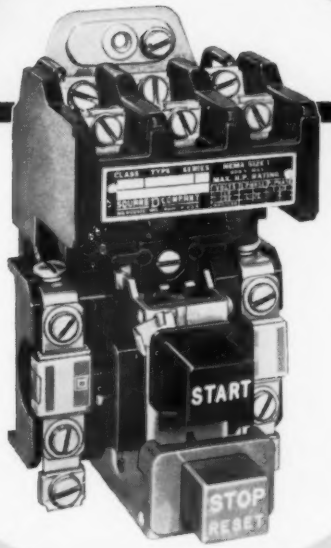
This NEW Manual Starter has EVERYTHING!



NEMA Sizes 0 and 1

Two, three and four-pole construction

- ***SMALLER!*** Takes less space, whether it's built into machine or mounted externally
- ***SMART STYLING!*** Matches the streamlined appearance of today's modern machines
- ***QWIK-MAKE, QWIK-BREAK!*** Positive snap-action opening and closing of contacts. Longer contact life
- ***TRIP-FREE OVERLOAD PROTECTION!*** Impossible for operator to hold motor circuit closed against overload
- ***POSITIVE PROTECTION!*** Starter will not operate *without* overload units installed
- ***LONGER LIFE!*** *Toggle Action* operating mechanism. Heavy-duty construction throughout
- ***EASIER INSTALLATION!*** Wire it without removing starter from enclosure. All terminals have pressure wire connectors
- ***EASIER MAINTENANCE!*** "Off-the-Shelf" parts kits make normal maintenance and modifications easier than ever. They're easy to buy, easy to identify, and faster to install
- ***TAMPER-PROOF!*** Cover padlocking device prevents tampering by unauthorized personnel. Safety latch locks "start" button in "OFF" position
- ***VISIBLE INDICATION OF OVERLOAD!*** Self-centering push-buttons show when overload has occurred



CHOICE OF ENCLOSURES:

- Water and Dust-Tight
- Hazardous Locations
- Flush Mounting

Write for **BULLETIN 2510 B-C**
Address Square D Company,
4041 North Richards Street,
Milwaukee 12,
Wisconsin

EC&M HEAVY INDUSTRY ELECTRICAL EQUIPMENT...NOW A PART OF THE SQUARE D LINE

SQUARE D COMPANY

NOW a single Condulet® for any make motor starter and circuit breaker!

CROUSE-HINDS TYPES DMC* AND WMC** Combination Line Starter CONDULETS

DMC-WMC Condulets are designed to accept and operate any of the various makes of motor starters and circuit breakers. Single speed non-reversing combinations are equipped with a universal mounting plate, motor starter reset assembly and circuit breaker operating assembly. No substitutions of any parts on the Condulets are required.

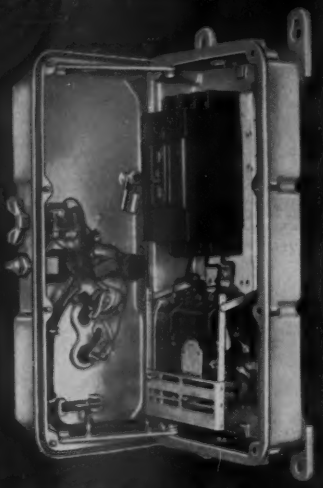
Built-in push-button stations and selector switches with various contact arrangements, pilot lights and control transformers can be supplied. Push-button and selector-switch operating shaft holes and pilot-light holes may be drilled, tapped and plugged for future use.

Separate mounting lugs are bolted on body. A center position is provided on back of body so that lugs can be attached for 3 point suspension or center pole (2 point) mounting. Circuit breaker handle has provision for padlocking in "On" or "Off" position.

WRITE for descriptive literature and specifications . . . or contact your Crouse-Hinds distributor.

*TYPE DMC: Dust-Ignition-Proof (Dust-Tight) — National Electrical Code Class II, Groups E, F and G; NEMA Type 9EFG.

**TYPE WMC: Watertight — NEMA Types 3, 3R, 4 and 5.



UNIQUE COVER HINGING ARRANGEMENT allows DMC-WMC Condulets to be mounted directly adjacent to other Condulets without providing extra space between for cover to hinge open. Cover pulls out, then to *either* side to clear adjacently-mounted Condulets or other equipment.

CROUSE HINDS

MAIN OFFICE AND FACTORY: SYRACUSE, NEW YORK

Crouse-Hinds Company of Canada, Ltd., Toronto, Ont.
Crouse-Hinds Instrument Company, Inc., Silver Spring, Maryland

● CONDULET® ELECTRICAL EQUIPMENT (Explosion-Proof and Conventional) ● FLOODLIGHTING
● TRAFFIC CONTROL SYSTEMS ● AIRPORT LIGHTING and WEATHER MEASURING EQUIPMENT

These products are sold exclusively through electrical distributors. For application engineering help, contact one of the following offices: Atlanta Baton Rouge Birmingham Boston Buffalo Charlotte Chicago Cincinnati Cleveland Corpus Christi Dallas Denver Detroit Houston Indianapolis Kansas City Los Angeles Milwaukee New Orleans New York Omaha Philadelphia Pittsburgh Portland, Ore. St. Louis St. Paul Salt Lake City San Francisco Seattle Tulsa Washington

Resident Representatives: Albany Baltimore Reading, Pa. Richmond, Va.